

UC DAVIS



General Catalog
1991-92

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General Catalog 1991-92



UCDAVIS

(USPS 646600)

PUBLISHED AT DAVIS, CALIFORNIA

Volume 31 June 1991 Number 2

A series of administrative publications of the University of California, Davis, California, 95616.

Five issues a year—one in March, one in June, two in July, and one in August.

Second-class postage paid at Davis, California.

POSTMASTER: Send change of addresses to General Catalog, University of California, Davis, CA 95616-8692.

Information herein is subject to revision.

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

Price \$4.00. Cost by mail (includes price of catalog): first class \$9.00, overseas: \$24.00 airmail or \$13.00 surface mail; pay by check or money order (payable to The Regents of the University of California); mail to Office of the Registrar, University of California, Davis, CA 95616-8692.

CONTENTS

Address Directory/4

Academic Calendar/5

Degrees Offered by UC Davis/6

Minor Programs Offered by UC Davis/8

Introduction/9

UC Davis, 10

The University of California, 12

Visiting the Campus, 12

Undergraduate Academic Programs, 12

The College of Agricultural and Environmental Sciences, 12

The College of Engineering, 13

The College of Letters and Science, 14

Academic Resources, 15

Undergraduate Admission/20

Preparing for University Work, 21

Admission as a Freshman, 21

Advanced Placement Examinations, 24

Admission as a Transfer Student, 26

Admission as an International Student, 27

Campus Selection Criteria, 27

Readmission, 28

Special Programs, 29

Admission Checklist, 29

Fees, Expenses and Financial Aid/30

Fees and Expenses, 31

Financial Aid, 32

Undergraduate Scholarships and Awards, 35

Student Life/36

Living at Davis, 37

Student Services, 37

Recreation and the Arts, 39

Associated Students (ASUCD), 43

Graduate Student Association, 43

Student Activities, 44

Judicial Affairs, 44

Alumni Association, 44

Academic Advising and Student Resources/45

Academic Advising, 46

The College of Agricultural and Environmental Sciences, 46

The College of Engineering, 47

The College of Letters and Science, 47

Division of Biological Sciences, 48

Other Academic Advising, 48

Academic Help, 49

Resolving Academic Problems, 50

Student Services, 51

Internships and Career Services, 53

Academic Information/54

Registration, 55

Enrollment in Courses, 55

Course Load, 56

Part-Time Student Status, 56

Academic Credit, 57

The Major, 58

The Minor, 59

Examinations, 60

Grades, 61

Honors and Prizes, 63

Withdrawals and Leaves of Absence, 64

Probation and Dismissal, 65

Summer Sessions, 66

Bachelor's Degree Requirements/67

University Requirements, 68

General Education Requirement, 70

College Requirements, 74

The College of Agricultural and Environmental Sciences, 74

The College of Engineering, 75

The College of Letters and Science, 79

The Graduate Division/83

Preparing for an Advanced Degree, 84

Applying for Admission, 85

Program of Study, 85

Intercampus Exchange Program, 86

Fellowships, Assistantships, and Loans, 86

Graduate Certificate Program for Engineering, 87

Teacher Credential Program, 87

School of Law/88

Preparation for the Study of Law, 89

Applying for Admission, 89

Program of Study, 91

School of Law Calendar, 91

Graduate School of Management/92

Preparation for the Study of Management, 93

Applying for Admission, 93

Program of Study, 93

School of Medicine/94

Preparation for the Study of Medicine, 95

Applying for Admission, 95

Program of Study, 97

School of Medicine Calendar, 97

School of Veterinary Medicine/98

Preparation for the Study of Veterinary Medicine, 99

Applying for Admission, 99

Program of Study, 100

School of Veterinary Medicine Calendar, 101

Programs and Courses/102

Course Designations, 103

Major Programs and Courses of Instruction, 104

Appendix/369

Statement on Legal Residence, 369

Accreditation, 370

Governance of the University, 370

Nondiscrimination, 370

Sexual Harassment, 371

Disclosures from Student Records, 371

Privacy Act, 371

Proportion of UCD Graduates Finding Work in their Fields of Choice, 372

Retention Data and Graduation Rates at UCD, 372

Salary and Employment Information, 372

Regents and Administrative Officers, UC, 373

Administrative Officers, Davis, 373

Index/375

Davis Campus Map/381

Credits/inside back cover

ADDRESS DIRECTORY

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

Office of the Chancellor
Mrak Hall
916-752-2065

College of Agricultural and Environmental Sciences
228 Mrak Hall
916-752-0107

College of Engineering
2132 Bainer Hall
916-752-0553

College of Letters and Science
150 Mrak Hall
916-752-0392

Graduate Division
252 Mrak Hall
916-752-0650

School of Law
1011 King Hall
916-752-0243

Graduate School of Management
308 Voorhies Hall
916-752-7362

School of Medicine
Medical Sciences 1C
916-752-0331

School of Veterinary Medicine
1018 Haring Hall
916-752-1360

Office of Summer Sessions
44 Mrak Hall
916-752-1647

University Extension
1333 Research Park Drive
916-752-0880

Admissions

Undergraduate:	Office of Admissions 175 Mrak Hall 916-752-2971
	EOP Office of Admissions 175 Mrak Hall 916-752-2993
Graduate:	Graduate Division Admissions 252 Mrak Hall 916-752-0655
Law:	School of Law Admissions 115 King Hall 916-752-6477
Management:	Graduate School of Management 311 Voorhies Hall 916-752-7399
Medicine:	School of Medicine Admissions Medical Sciences 1C 916-752-2717
Veterinary Medicine:	School of Veterinary Medicine Admissions 1044 Haring Hall 916-752-1383

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

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

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

Fellowships and Graduate Scholarships

Graduate Division
252 Mrak Hall
916-752-7481

Teaching and Research Assistantships

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

Housing

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

ASUCD (Associated Students UCD)

3rd floor, Memorial Union
916-752-1990

Disability Resource Center

101 Silo Student Center
916-752-3184 (voice), 916-752-6889 (telephone device for the speech and hearing impaired)

Memorial Union Information Desk

916-752-2222

News Service

334 Mrak Hall
916-752-1930

Relations with Schools/EOP Outreach Services

2828 Chiles Road
916-757-3108

Residency Matters, Attorney in

590 University Hall
University of California
Berkeley, CA 94720

Student Health Service

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

Information Services Office

129 Mrak Hall
916-752-0539
(campus tours, maps, and information)

ACADEMIC CALENDAR*

	FALL 1991	WINTER 1992	SPRING 1992	FALL 1992
Pick up registration and course enrollment materials (all continuing students)	May 30-Aug. 2	Nov. 4-8 (1991)	Feb. 10-14	May 28-July 31
Faculty advisers available to all students	May 30-31	Nov. 7-8	Feb. 13-14	May 28-29
Turn in course enrollment forms and student data card (all continuing students)	May 30-Aug. 2	Nov. 4-8	Feb. 10-14	May 28-July 31
Turn in fees along with fee statement	May 30-Aug. 16	Nov. 4-21	Feb. 10-Feb. 28	May 28-Aug. 14
Quarter begins	Sept. 23, Mon.	Jan. 6, Mon.	April 2, Thur.	Sept. 21, Mon.
In-Person Registration	Sept. 23-24	Jan. 6-7	Apr. 2-3	Sept. 21-22
In-Person Enrollment	Sept. 25	Jan. 7	Apr. 3	Sept. 23
Final day to petition for reclassification to resident status	Sept. 26	Jan. 8	Apr. 6	Sept. 24
Instruction begins	Sept. 26, Thur.	Jan. 8, Wed.	Apr. 6, Mon.	Sept. 24, Thur.
Final day	Oct. 9, Wed.	Jan. 22, Wed.	Apr. 17, Fri.	Oct. 7, Wed.
<ul style="list-style-type: none"> of late registration to change status from part-time to full-time or vice versa to add courses without paying a \$3 fee to file petitions for PELP 				
Final day	Oct. 30, Wed.	Feb. 11, Tue.	May 8, Fri.	Oct. 28, Wed.
<ul style="list-style-type: none"> to add or drop courses to file to take courses on a P/NP basis to file to take courses on a S/U basis 				
Deadline for filing Independent Study Program project proposal form	April 12, Fri.	Oct. 9, Wed. (1991)	Jan. 17, Fri.	April 17, Fri.
Instruction ends	Dec. 6, Fri.	Mar. 18, Wed.†	June 11, Thur.	Dec. 4, Fri.
Final examinations	Dec. 9-14	Mar. 20-26	June 13-19	Dec. 7-12
Quarter ends	Dec. 14, Sat.	Mar. 26, Thur.	June 19, Fri.	Dec. 12, Sat.
Commencement			Mid-June	
Academic and Administrative Holidays	Nov. 28-29 Dec. 24-25 Dec. 31-Jan. 1	Jan. 20 Feb. 17 Mar. 30	May 25	Nov. 26-27 Dec. 24-25 Dec. 31-Jan. 1
Summer Sessions I and II				
June 22-July 31, 1992 and Aug. 3-Sept. 11, 1992				
Financial Aid Deadlines				
Filing period for grants, loans, work-study, and California Student Aid awards for 1992-93		Jan. 1-Mar. 2		
Filing for Graduation				
Filing period for those who expect to complete work for a bachelor's degree to file with the Office of the Registrar‡	May 27-Sept. 16	Nov. 11-Dec. 20 (1991)	Feb. 7-Mar. 20	May 29-Sept. 18
Deadline for students who plan to complete a minor program to file with the Dean's Office‡	Oct. 9	Jan. 22	Apr. 17	Oct. 7
Admission Deadlines				
Deadline for undergraduates to file admission applications for 1991-92	Nov. 30 (1990)	July 31 (1991)	Oct. 31 (1991)	Nov. 30 (1991)
Deadline for filing applications with the Registrar for readmission to undergraduate status	Aug. 23 (1991)	Nov. 29 (1991)	Feb. 21	Aug. 21

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

†Note: Wednesday, March 18, treated as Monday for class schedule purposes.

‡For students graduating September 1992, the filing period is May 25-July 3. Deadline to file a minor program with Dean's Office: July 3.

DEGREES OFFERED BY UC DAVIS

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

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

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

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

†Joint program between UCD and CSU, Fresno

MINOR PROGRAMS OFFERED BY UC DAVIS

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

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

Introduction



UC DAVIS

With 5,200 acres, UC Davis ranks first in physical size of the nine campuses of the University of California. It's also one of the nation's top 20 universities in research funding and has 11 undergraduate programs rated among the country's top 10, including the No. 1 botany department. What does this mean to you as a student? It means that the University's reputation for excellence has attracted a distinguished faculty of scholars and scientists in all fields of scholarship. Creative teaching and academic innovation are encouraged by several programs, including the \$25,000 prize for Teaching and Scholarly Achievement, believed to be the largest award of its kind in the country.

The teaching faculty of 1700 is also supported by campus resources such as the Teaching Resources Center, which helps professors and teaching assistants sharpen their teaching skills, and the Learning Skills Center, which assists faculty in preparing classroom materials. Constructive criticism is provided by the Student Viewpoint, an evaluation of classes and instructors which is compiled each year from course questionnaires completed by students. Additional academic resources include laboratories; natural reserves; institutes; and centers for research, teaching, or service to students, faculty, or the community.

The Davis campus has undergraduate colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. Undergraduate enrollment is close to 18,400 students. 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 5,500 students are engaged in graduate or professional study.

A Small-Town Setting

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

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

For long distance travel, the city has a Greyhound bus terminal and an Amtrak station. If you travel by plane, the Sacramento Metropolitan Airport is an easy 20-minute drive from downtown Davis. Within Davis, bicycles are a favorite mode of transportation. The terrain is flat and 46 miles of bike paths crisscross the city. With more bicycles per person than any other city in the nation, Davis has earned the title "City of Bicycles."

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

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

The City of Davis

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

Students comprise nearly half of the city's population of 46,000, making Davis one of the state's few remaining "college towns." You'll find an abundance of bookshops, coffee houses, and restaurants catering to students in the bustling downtown area adjacent to campus.

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

The city has long recognized the importance of open space in maintaining its small-town atmosphere and has created 18 city parks offering a variety of attractions: tennis courts, playgrounds, swimming pools, and playing fields.

Campus Life

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

Underlying the casual style of Davis students, however, is a fundamental seriousness and a dedication to academic excellence. Davis students do study hard. After your studying is done, however, you can relax at a movie, public lecture, dance recital, or concert. For the energetic, 20 intercollegiate sports, 35 club sports, and one of the largest intramural programs in the country offer athletics for fun or competition.

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

The University Farm

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

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

PRINCIPLES OF COMMUNITY

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

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

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

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

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

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

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

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

THE UNIVERSITY OF CALIFORNIA

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

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

All the campuses adhere to the same admission guidelines and high academic standards, yet each has its own distinct character, atmosphere, and academic individuality. Together, the nine campuses have an enrollment of more than 166,500 students, 90 percent of them California residents.

Some 150 laboratories, extension centers, and research and field stations strengthen teaching and

research while providing public service to California and the nation. The collections of the more than 100 UC campus libraries are surpassed in size in the United States only by the Library of Congress collection.

The faculty of the University of California is internationally known for its distinguished academic achievements. On its nine campuses, the University has 26 Nobel laureates, and membership in the National Academy of Sciences is the largest of any university in the country. In 1991, 15 scholars from within the University received a Guggenheim fellowship grant, one of the highest honors that a scholar can receive.

VISITING THE CAMPUS

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

Information: Information Services Office, 129 Mrak Hall, 916-752-0539

UNDERGRADUATE ACADEMIC PROGRAMS

The College of Agricultural and Environmental Sciences

The College of Agricultural and Environmental Sciences offers a unique combination of diverse programs that have grown from a shared commitment to improve the quality of life in all its facets. Although its roots are in traditional agriculture and it is still world-renowned for its agricultural programs, the shared commitment has led to the College's expansion into programs which address four major areas: natural resources and the protection of the environment; the production, distribution, and utilization of food and



fiber; the advancement of basic biology, which underpins successful strategies to meet human needs; and issues of the enhancement of the human environment, including environmental design.

The College offers 38 majors in many different areas, including environmental biology and resource sciences, environmental toxicology and pest management, animal and plant sciences, basic biology, food production and processing, nutrition, human development, design, and managerial economics. The College strives to provide students with the intellectual tools to master their area of study and the ability to apply this knowledge to the world outside the university.

The College offers several levels of academic advising in order to help students get the most out of their education. Advisers can assist students in meeting degree requirements and in taking maximum advantage of the resources available at the University. Students are encouraged to talk not only with their assigned faculty adviser, but also with Advising Associates and peer advisers in different departments. This allows students to make educational decisions on the basis of information and ideas from a wide variety of disciplines. Although degree requirements may appear complex, they are usually flexible enough for students to individualize their study programs. With the help of faculty advisers, students can explore many different areas while progressing toward their major degree objectives.

It is the students' responsibility to maintain regular contact with their faculty advisers, and good relationships are developed by meeting frequently and discussing evolving interests and goals. Faculty and students working together helps keep the College of Agricultural and Environmental Sciences vital and produces individuals committed to improving the relationship of humanity with the natural world.

Information: College Office, 228 Mrak Hall, 916-752-0107

The College of Engineering

The College of Engineering has a tradition of excellence in instruction, in research, and in public service. With an undergraduate enrollment of approximately 2,200 and a graduate enrollment of 750, the College can offer both a friendly atmosphere and the varied academic programs in basic sciences and engineering that have made UCD engineering graduates highly valued in industry and research.

The College has six departments; each has outstanding programs of instruction. The Department of Agricultural Engineering combines study in engineering with instruction in the biological processes used to solve challenging environmental and technical problems. The Department of Applied Science instructs engineering graduate students in broad areas of scientific technology. The Department of Chemical Engineering offers a curriculum integrating an effective knowledge of chemistry with engineering sciences to enable students to solve problems in both current and future product technologies. Devoted to the improvement of the human environment to make our activities and surroundings more productive, safe, enjoyable, and aesthetic, the Department of Civil Engineering trains students to plan and design systems that have



a direct impact on the health and quality of human life. The Department of Electrical Engineering and Computer Science offers programs in research and education crucial for the continued success of high technology industries in California and the nation, preparing students to design, analyze, and use electronic and computer systems effectively. The Department of Mechanical, Aeronautical, and Materials Engineering educates students to design and manufacture complex engineering systems for transport, industry, or energy; to design, manufacture, and operate aircraft and aeronautical structures; or to analyze the structure, properties, and behaviors of materials.

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

Undergraduate education in engineering at Davis is intended to serve as a sound basis for beginning pro-



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

Engineers will continue to face new challenges as society continues its demand for improvements in the quality of life. As a unit in a land-grant institution, the UCD College of Engineering must help maintain the technological leadership long enjoyed by the United States, while advancing technology for the benefit of all.

Information: Dean's Office, 2132 Bainer Hall, 916-753-0553

The College of Letters and Science

The College of Letters and Science is the largest of the three undergraduate colleges at UC Davis. Through its more than 600 faculty members, the College offers over fifty major programs of study and thousands of courses per year in the fine arts, humanities, life sciences, physical sciences, social sciences, and mathematical sciences. The College confers Bachelor of Arts (A.B.), Bachelor of Science (B.S.), and Bachelor of Arts and Science (B.A.S.) degrees.

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

be able to continue the on-going process of education that begins in the classroom but continues over a lifetime. They will have learned how to learn—the ultimate objective of a liberal arts education.

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

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

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

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

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

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

Information: Dean's Office, 150 Mrak Hall, 916-752-0392

ACADEMIC RESOURCES

Central Support

The University Library

The General Library at the University of California, Davis, is composed of the Peter J. Shields Library, the Physical Sciences Library, the 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 the Law Library located at the King Hall Law School.

The libraries contain over 2.3 million volumes and receive about 51,600 periodical and journal titles annually. Shields Library houses the collections in the humanities, arts, social sciences, biological sciences, and agricultural sciences. The collections of the Physical Sciences Library support teaching and research in engineering, computer sciences, physical sciences, and mathematics. The library maintains a collection of one million research reports of the U.S. Department of Energy, the National Aeronautics and Space Administration, the Nuclear Regulatory Commission, and other governmental agencies. The Carlson Health Sciences Library serves the Schools of Medicine and Veterinary Medicine with a collection of approximately 217,000 volumes. The Agricultural Economics Library holds more than 7,500 bound volumes and 244,000 unbound pamphlets in this field. The library at the UCD Medical Center provides a clinical collection of 22,000 volumes.

Information: Library Administration Office, Shields Library, 916-752-6561

Computing Services

Computing Services provides batch, interactive time-sharing, and remote job entry mainframe computing. Additionally, many microcomputers and scientific workstations are provided for student use at no charge. Computers operated by Computing Services include: a Unisys A10FX, the primary administrative computer; a Unisys A6KX for administrative development work and an A10FX backup; and three DEC VAX 11/785s and two VAX 8600s for academic use. These systems support over 100 terminals located in four student terminal rooms, plus over 3,000 additional terminals and microcomputers located throughout the campus.

Information: Surge II, 916-752-0233

University Arboretum

The 150-acre University Arboretum, located along Putah Creek's historic north fork, maintains a large collection of dry-land trees and shrubs for use in teaching and research. Outstanding plant collections include the oaks in the Shields Grove, the Mary Wattis Brown Garden of California native trees and shrubs, the Ruth Storer Garden of drought-tolerant flowering perennials, and the T. Elliot Weier Redwood Grove. The Arboretum program of seed exchange is international in reputation and has provided the University with numerous exotic plant specimens and also serves to distribute California native plants throughout the world. Internships are available in nursery man-

agement, landscape design and maintenance, environmental education, conservation biology, and Geographic Information Systems (GIS).

Information: Arboretum Headquarters, 916-752-2498

Agricultural and Environmental Sciences

Agricultural History Center

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

Information: 378 Voorhies Hall, 916-752-1827

California Agricultural Experiment Station

The California Agricultural Experiment Station has branches in Davis, Riverside, and Berkeley. The Davis branch includes 500 faculty in over 30 departments in the College of Agricultural and Environmental Sciences and the School of Veterinary Medicine. In addition to lab facilities, it has approximately 3,000 acres devoted to agricultural research in the areas of experimental crops, orchards, and animal facilities. The Experiment Station facilitates research in agricultural production, food processing, nutrition, animal care and disease prevention, consumer sciences and community development, and environmental quality. Research emphasis is placed on resource conservation and management, water and soil pollution, and regional planning.

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

Institute of Ecology

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

Information: 2132 Wickson Hall, 916-752-3026

Institute of Toxicology and Environmental Health (ITEH)

ITEH coordinates interdisciplinary research concerned with biomedical and toxicological problems related to exposure to chemical, physical, and biological toxic agents or to ionizing radiation. 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 Universitywide programs in toxic substances and occupational health.

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

J.M. Tucker Herbarium

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

Information: Department of Botany, 916-752-0617

Jepson Prairie Reserve

The Jepson Prairie Reserve is used to study the effects of long-term grazing, to conduct fire ecology research, and to aid in management of native grasslands. The reserve is located fifteen miles south of the campus and comprises 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.

Information: Institute of Ecology, 2126 Wickson Hall, 916-752-6580

Mann Laboratory

Personnel housed in the Mann Laboratory study the physiology and biology of harvested vegetables, train students, and extend information about postharvest biology and technology to growers, shippers, marketers and consumers. The facility is part of the Department of Vegetable Crops and houses 16 controlled-temperature rooms, seven research laboratories, a teaching laboratory, and a library/conference room.

Information: 113 Mann Laboratory, 916-752-1410

Putah Creek Campus Reserve

The goals of the Putah Creek Campus Reserve are habitat conservation, education, research, and environmentally-directed recreation. The reserve consists of a 150-acre corridor along the north bank of Putah Creek and is approximately 6 kilometers long and averages 100 meters wide. Vegetation and wildlife include native and introduced species.

Information: University Arboretum, 916-752-2498

Water Resources Center

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 drought responses, 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.

Information: University Extension Building, 916-757-8901

Stebbins Cold Canyon Reserve

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. The 576-acre reserve is located 24 miles west of campus near Lake Berryessa and is available for teaching and field research by scientists and students.

Information: Department of Avian Sciences, 3202 Meyer Hall, 916-752-1300

Sustainable Agriculture Program: Student Experimental Farm

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

Information: College of Agricultural and Environmental Sciences, 916-752-7645

UC Agricultural Issues Center

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

Information: 110 University House, 916-752-2320

Biological and Life Sciences

Adult Fitness Program

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

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

Bodega Marine Reserve

The Bodega Marine Reserve is 362 acres of coastal



habitat near Bodega Bay in western Sonoma County, approximately 100 miles from the Davis campus. This site includes a remarkably diverse set of habitats, including an excellent rocky intertidal zone, sand beaches, saltmarsh, lagoon tidal flats, freshwater marsh, coastal prairie, and dunes. Adjacent subtidal sand and rock habitats in a Marine Life Refuge are administered as part of the reserve. Located within the reserve is the Bodega Marine Laboratory, an organized research unit dedicated to research and teaching in marine and coastal biology and related fields. Current areas of research on the Reserve include population biology and behavior of insects, shorebirds, marine invertebrates and fishes; plant-insect interactions; population genetics of coastal plants; subtidal biomechanics; and other topics.

Information: Peter G. Connors, Ph.D., Reserve Manager, P.O. Box 247, Bodega Bay, CA 94923, (707) 875-2020 or (707) 875-2211

California Primate Research Center (CPRC)

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

Information: Primate Center, 916-752-0447

Food Intake Laboratory

The Food Intake Laboratory supports predoctoral and postdoctoral research in nutrition and behavior. Studies on the control of food intake and the nature of the factors that govern feeding choices are emphasized. The laboratory promotes collaborative research involving the role of metabolic, psychological, neurochemical, hormonal, gender, genetic, and sensory inputs in the feeding behavior of humans and experimental animals.

Information: TB 33, 916-752-7516

Health Sciences Research Labs

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

- **Animal Surgery Laboratory**—provides instruction and facilities for the preparation of monoclonal antibodies. The laboratory is also developing additional lines of animal plasmacytomas.

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

- **Biochemistry and Special Instrumentation Laboratory**—includes ultracentrifuges, beta and gamma spectrometers, and spectrophotometers.

Information: TB 161, 916-752-3166

- **Electron Microscopy Laboratory**—transmission and scanning electron microscopes, freeze fracture

apparatus, ultramicrotome, darkroom, photomicroscope, and complete EM specimen preparation facilities.

Information: 9 Hutchison Hall, 916-752-0284

- **Protein Structure Laboratory**—instrumentation for quantitative amino acid analysis and automated sequencing by Edman degradation, ancillary instrumentation for identification of amino acid phenylthiohydantoin. This laboratory also houses a DNA-synthesizer and a flow cytometer for fluorescence-activated cell sorting.

Information: 1145 Surge 1, 916-752-6228

Human Performance Laboratory

The Human Performance Laboratory houses equipment for the study of blood and muscle chemistry and enzymology, metabolism and energetics, muscle mechanics and electromyography, movement kinetics and kinematics, body composition and anthropometry, cardiorespiratory function during exercise in a controlled environment, control and acquisition of motor skills, and the psychosocial aspects of human performance. DEC LSI-11 minicomputers, and Apple Macintosh and IBM microcomputers are located within the Laboratory and can be used for data collection, reduction, graphing, and statistical analysis as well as for biomechanical, physiological systems, and human performance modeling.

Information: 164 Hickey Gym, 916-752-0965

Institute of Marine Resources

The marine food science component of this statewide institute is 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 seafood. 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.

Information: Temporary Building 186, 916-752-2506

Serology Laboratory

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; investigation of the mode of inheritance of several suspected hereditary diseases; and karyotyping for diagnosis of clinical diseases.

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

Veterinary Medicine Teaching and Research Center (VMTRC)

VMTRC serves as the principal clinical center of UCD's School of Veterinary Medicine. The Center offers a forum for teaching, research, and service pro-

grams on food-animal herd health, preventive medicine, and production management.

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

Engineering and Physical Sciences

Crocker Nuclear Laboratory

This facility is an interdepartmental laboratory for the application of nuclear science to a variety of disciplines. The laboratory has research programs in nuclear physics and chemistry, air pollution analysis, activation analysis, biology, 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.

Information: Crocker Nuclear Laboratory, 916-752-1460

Center for Geotechnical Modeling

At the Center for Geotechnical Modeling, research in physical and numerical modeling is conducted by faculty and students from several departments and campuses of the University. The center operates two small centrifuges and the large National Geotechnical Centrifuge. These centrifuges are used for research on geotechnical problems such as the effect of earthquakes on earth structures, toxic waste transport, and foundations of large buildings.

Information: 2092 Bainer, 916-752-6986

Facility for Advanced Instrumentation

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. Morphometric analysis is supported by a computerized digitizing tablet and 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.

Information: 9 Hutchison Hall, 916-752-0284

Institute of Theoretical Dynamics

The Institute promotes the study of the ways in which physical, chemical, and biological systems change over the course of time. Studies in theoretical population dynamics are being used by faculty in genetics and mathematics to study changes in animal populations. Faculty in chemistry and physics are studying the dynamics of chemical reactions, changes which occur among elementary particles, and molecular processes in cell biology. In the departments of engineering and mathematics, faculty are developing methods for analyzing and solving dynamical equations, and applying these methods to problems in ecology, pest management, movement control of robots, and the flow of fluids past objects of irregular shape.

Information: 508 2nd Street, Suites 206-207, Davis, CA 95616, 916-752-0938

Intercampus Institute for Research at Particle Accelerators

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

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

Nuclear Magnetic Resonance Facility

The Nuclear Magnetic Resonance Facility provides researchers with direct access to high resolution 500 MHz and 300 MHz General Electric spectrometers. Experts in NMR are available to advise and assist in the application of NMR to problems in chemistry, biochemistry and molecular biology. For the study of metabolic processes in animals, a 1.9 Tesla spectrometer with a horizontal bore of 200 mm is available to obtain localized spectra and magnetic resonance images from animals. A 7 Tesla spectrometer for both in vivo NMR and magnetic resonance imaging is also available.

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

X-Ray Crystallographic Facility

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

Information: Department of Chemistry, 916-752-6668

Humanities and Social Sciences

Center for Consumer Research

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. In addition to a core research program, activities of the Center include support of consumer projects undertaken by faculty, graduate students, and Extension specialists; and a newsletter. The Center also houses a library containing books and periodicals on consumer-related topics.

Information: 148 Everson Hall, 916-752-2647

Early Childhood Laboratory

The Early Childhood Laboratory provides 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.

Information: Temporary Building 117, 916-752-2888

Humanities Institute

The Davis Humanities Institute promotes the intellectual vitality of the humanities by organizing interdisciplinary research programs and co-sponsoring discussions with other departments. Under its fellowship program, three visiting fellows spend a year in residence at the Institute along with nine campus fellows who each spend one quarter in residence and participate in a year-long seminar on themes selected by the Humanities Institute Board. The Institute also produces Humanities at Davis and sponsors an Interdisciplinary Graduate Seminar.

Information: 508 Second Street, Suite 202, Davis, CA 95616-8612, 916-753-8979, FAX: 916-756-2876

Institute of Governmental Affairs

The Institute of Governmental Affairs (IGA) serves as a center for advanced social science research. IGA offers research opportunities for faculty, undergraduate, and graduate students, as well as for visiting scholars from throughout the United States and around the world. The Institute houses two Centers: the Center for Regulation and Deregulation and the Center for State and Local Taxation. In addition, IGA sponsors eight research programs: Productivity and Quality Control; Labor and Immigration Policies; International Conflict and Cooperation; Economy, Justice and Society; Pacific Rim Studies; Government and Politics; East Asian Business and Development; and Applied Public Policy. The Institute also supports a wide range of public affairs programs, seminars, and conferences designed to foster debate on political, economic and social issues. IGA provides specialized library services, and oversees the Social Science Data Service.

Information: Shields Library, 916-752-2042

Social Science Data Service

The Social Science Data Service provides assistance to students and faculty interested in quantitative research involving the use of the computer. The facility offers consultation, statistical package instruction, data file maintenance, a data library, limited program writing, and assistance in the acquisition of computer time.

Information: 161 AOB 4, 916-752-6063

Undergraduate Admission



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

The Undergraduate Application Packet may be obtained from the counseling office of any California high school or community college or from the admission office of any UC campus.

Application Filing Periods

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

Quarter of Attendance

Filing Periods

Winter quarter 1992	July 1-31, 1991
Spring quarter 1992	October 1-31, 1991
Fall quarter 1992	November 1-30, 1991
Winter quarter 1993	July 1-31, 1992

Submit your completed application form to

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

Application Fees

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

PREPARING FOR UNIVERSITY WORK

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

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

Reading: You should become proficient in reading and understanding technical materials and scholarly works. 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.

ADMISSION AS A FRESHMAN

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

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

The following describes the minimum requirements to establish eligibility at the University of California. At

UC Davis, students generally must perform well above these minimums in order to gain admission.

Requirements for California Residents

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

Subject Requirements: A to F

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

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

A. History—1 year

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

B. English—4 years

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

C. Mathematics—3 years

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

D. Laboratory Science—1 year

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

E. Foreign Language—2 years

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

F. College Preparatory Electives—4 years

Four years in addition to those required in "A" through "E" above, to be chosen from at least two of the following subject areas.

- **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); or
- 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.

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

Eligibility Index

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 minimally 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 minimally eligible for the University by achieving the specified scores on the standardized tests (see the Eligibility Index opposite).

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

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

Examination Requirement

All freshman applicants must submit scores from the College Board or the American College Testing (ACT) Program. If you are applying for admission to the fall quarter, 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 minimum eligibility.

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

Grade Point Averages A-F Requirement	SAT† Total Scores	ACT* Composite Scores
2.78	1600	36
2.79	1580	36
2.80	1550	35
2.81	1530	35
2.82	1510	35
2.83	1480	34
2.84	1460	34
2.85	1440	34
2.86	1410	33
2.87	1390	33
2.88	1370	32
2.89	1340	32
2.90	1320	31
2.91	1300	31
2.92	1270	30
2.93	1250	30
2.94	1230	29
2.95	1200	29
2.96	1180	28
2.97	1160	28
2.98	1130	27
2.99	1110	26
3.00	1090	26
3.01	1060	25
3.02	1040	25
3.03	1020	24
3.04	990	24
3.05	970	23
3.06	950	23
3.07	920	22
3.08	900	21
3.09	880	21
3.10	850	20
3.11	830	20
3.12	810	19
3.13	730	19
3.14	760	18
3.15	740	18
3.16	710	17
3.17	690	17
3.18	670	16
3.19	640	16
3.20	620	15
3.21	600	15
3.22	570	14
3.23	550	14
3.24	530	13
3.25	500	13
3.26	480	12
3.27	460	12
3.28	430	11
3.29	410	10
3.30	400	10

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

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

Make arrangements to take the required 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.

Notification

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

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 complete the form and return it to this office, along with the required nonrefundable \$100 deposit, in order to complete the admissions process. This advance deposit is applied to your University Registration Fee as long as you register in the quarter to which you are admitted. Intercampus transfer, EOP, and readmission applicants are not required to submit the \$100 advance deposit; however, they will pay full registration fees at the time of registration.

Requirements for Residents of Other States

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

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

Admission by Examination Alone

If you do not meet the scholarship and subject requirements for minimum eligibility and have completed fewer than 12 quarter or semester units of transferable college work since high school graduation, you can qualify for minimum eligibility 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.

High School Proficiency Examination

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

Transfer Credit

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

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

ADVANCED PLACEMENT EXAMINATIONS

If you take one or more of the College Board Advanced Placement (AP) Examinations and score 3, 4, or 5, you will be awarded college credit. The credit will become part of the minimum 180 quarter units you need in order to receive a bachelor's degree. The credit from the AP Examinations may also be used to satisfy specific degree requirements. Consult the chart on the facing page to learn how many units you will receive for an AP Examination (see the column headed: Credit Toward Degree), and how those units will be applied toward specific degree requirements (see the column headed: Credit Allowed Toward Specific Degree Requirements). Please note that the courses for which AP credit has been granted may not be used as a substitute for courses required as part of the UCD General Education Requirement. Rather, AP credits are counted as transfer credits and may reduce the number of General Education (GE) courses you have to complete. (See GE section in next chapter.)

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

ADMISSION AS A TRANSFER STUDENT

The University of California defines a *transfer applicant* as a student who is a high school graduate and has been a registered student in a college or university or in college-level extension classes following high school graduation. Summer session attended immediately following high school graduation is excluded in this determination. If you are a transfer applicant, you

College Board Advanced Placement (AP) Examination Credit

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. <i>College of Agricultural and Environmental Sciences:</i> 4 units Four units satisfies first part of English composition requirement. <i>College of Engineering:</i> 8 units Satisfies English 1, 4 units toward Humanities and Social Sciences electives, and 2 units toward Unrestricted electives.	
English	3	English A		8 units	<i>College of Letters and Science:</i> Satisfies first course toward English Composition requirement. Satisfies Subject A requirement.	
FOREIGN LANGUAGES						
French	5	French 22	French 23, or consultation with adviser	8 units	Humanities Credit/Unrestricted Electives 4 units For each foreign language examination passed. In the <i>College of Agricultural and Environmental Sciences</i> , satisfies credit toward breadth/Unrestricted electives. In the <i>College of Letters and Science</i> , examinations (except for Latin) satisfy the Foreign Language requirement. In the <i>College of Engineering</i> , 4 units toward Humanities/Social Science electives.	
French	4	French 21	French 22	8 units		
French	3	French 3	French 21	8 units		
German	5, 4	German 4, 6A, or 6B	German 101, upper division literature courses	8 units		
German	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		
Latin (Lyric)	5, 4, 3	Latin 2	Determined by consultation with Classics adviser	4 units		
Spanish	5, 4	Spanish 21 or 8	Spanish 22, 24 or 23, or more advanced course in consultation with adviser	8 units		
Spanish	3	Spanish 3	Spanish 4, or consultation with adviser	8 units		
HUMANITIES						
Art Studio	5	Art 2, 5		8 units	Humanities Credit/Unrestricted Electives 8 units In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. 4 units In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. 8 units In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree. 8 units Satisfies American History and Institutions requirement. History 17A, 17B, and 17C may be taken for full credit. 8 units History 4A and 4B may be taken for full credit. 8 units 4 units In the <i>College of Letters and Science</i> , partially satisfies Area (breadth) requirements for A.B. degree.	
Art Studio	4	Art 2		4 units		
Art History	5	Art 1A, 1B, 1C		8 units		
American History	5, 4, 3	History 17A, 17B		8 units		
European History	5, 4, 3	History 4B, 4C		8 units		
Music	5, 4, 3	Music 10		8 units		
NATURAL SCIENCES						
Biology	5, 4, 3	Biological Sciences 10		8 units	Natural Sciences Credit/Preparatory Courses for Science Majors 4 units Biological Sciences 1A is the first course taken by most students contemplating majors in the Life Sciences. 8 units Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with consent of instructor. Although 1A and/or 1B may be taken for full credit, students are strongly encouraged to enroll in the 4A-4B-4C sequence. 4 units Credit for Computer Science Engineering 30 may serve as prerequisite for Computer Science Engineering 40 with consent of instructor In the <i>College of Engineering</i> , rewards units towards the unrestricted electives requirement. 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 8 units Mathematics 16A, 16B, 21A, or 21B may be taken for full credit. Mathematics 16A, 16B, 21A, or 21B equivalents may serve as a prerequisite for Mathematics 16B, 16C, 21B, or 21C. 8 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. 8 units No credit for laboratory parts of Physics 5 or 9. 8 units Course equivalents may be used as prerequisite for succeeding courses of same series with consent of instructor. 4 units 4 units In the <i>College of Engineering</i> , only a score of 5 on Physics (CI and CII) Examinations applies toward Physics requirement. 4 units 4 units 4 units 4 units	
Chemistry	5, 4	Chemistry 1A, 1B		8 units		
Computer Science AB	5, 4	Computer Science Engineering 30	Computer Science Engineering 40	4 units		
Computer Science AB 3				4 units		
Computer Science A	5, 4, 3		Computer Science Engineering 30	2 units		
Mathematics AB	5, 4	Mathematics 11, 16A, or 21A	Mathematics 16B or 21B	4 units		
Mathematics AB	3		Mathematics 16A or 21A	4 units		
Mathematics BC	5	Mathematics 11, 16A-16B, or 21A-21B	Mathematics 16C or 21C	8 units		
Mathematics BC	4, 3	Mathematics 11, 16A, or 21A	Mathematics 16B or 21B	8 units		
Physics B	5	Physics 1A, 1B, 5A, 5B, 5C, 10	Determined by consultation with adviser	8 units		
Physics B	4, 3	Physics 10		8 units		
Physics CI	5	Physics 1A, 5A, or 9A		4 units		
Physics CI	4	Physics 1A or 5A		4 units		
Physics CII	5, 4	Physics 1B		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. 4 units In <i>College of Agricultural and Environmental Sciences</i> , satisfies credit toward breadth requirement or Unrestricted electives. In <i>College of Engineering</i> , awards credit toward Humanities-Social Sciences electives requirement.
Comparative Government and Politics	5, 4, 3	Political Science 2		4 units		
Economics	5, 4, 3	Economics 1A, 1B	Determined by consultation with Economics adviser.	8 units		

may not disregard your college record and apply for admission as a freshman.

If you are a California resident, you must meet the requirements that follow. If you are not a California resident, see Requirements for Residents of Other States below.

Requirements for California Residents

As a transfer applicant you must meet one of the following conditions:

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

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

- If you have graduated from high school and meet the needed Scholarship and Examination Requirements but you have not completed one or more of the "A to F" subjects while in high school, you may be eligible to be considered for admission 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 scholarship requirement and did not meet the scholarship requirement *and* lack the required subjects, you may be eligible to be considered for admission after you have:

1. completed 84 transferable quarter (56 semester) units of credit in college courses; and

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

3. completed one of the following:

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

or

- b. a college course, or courses, in mathematics; one 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 component must at least be equal to algebra, geometry, and advanced algebra. A course for which advanced algebra is a prerequisite, including statistics, will satisfy the entire requirement. Courses on the appli-

cation of statistics to particular disciplines (i.e., business statistics) may not be used to satisfy this requirement. Courses other than mathematics must be transferable to the University.

Requirements for Residents of Other States

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

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

Transferring to the College of Engineering

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

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

Unit Credit for Courses Taken Elsewhere

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

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

UC Intercampus Transfer

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

ADMISSION AS AN INTERNATIONAL STUDENT

Applicants from other countries will be admitted in accordance with the general procedures governing nonresident admission. An international application may be obtained by writing the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, California, 95616. 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.

Before being admitted, you must complete a Confidential Financial Statement and provide copies of your transcripts to the Undergraduate Admissions Office. The Confidential Financial Statement is required to demonstrate that you can provide \$20,000 (or more, based on proposed fee increases) per year for educational fees and living expenses.

Applicants whose native language is not English or whose schooling has not been in the English language must take the Test of English as a Foreign Language (TOEFL). A minimum score of 500 is required. To arrange a testing date and location in your home country write to the Educational Testing Service, P.O. Box 899, Princeton, New Jersey, 08540.

In addition to taking the TOEFL, international students whose native language is not English are required to take a proficiency examination given at UC Davis 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.

For additional information, look under International Student Services in the Academic Advising and Student Resources section of this catalog.

CAMPUS SELECTION CRITERIA

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

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

The selection criteria described below are only for applicants for the fall 1991 term. The criteria may differ for the winter and spring terms because enrollment targets and applicant qualifications change. Applicants for winter or spring should contact the Undergraduate Admissions Office for more information.

Selection Guidelines

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

Freshman Applicants

Davis ranks all freshman applicants using the following academic index: $[1,000 \times \text{Grade Point Average (capped at 4.00)}] + [(\text{SAT Verbal}) + (\text{SAT Math}) \text{ or (composite ACT scores)}] + (\text{three required College Board Achievement Tests})$.

Academic Criteria (used to select 40% of admits): Applicants in all majors are selected on the basis of academic index score.

Supplemental Criteria (used to select 60% of admits): The academic index is used as the basis for selection, with consideration of additional factors, including intended major, strength and range of college preparatory courses, and personal accomplishments and qualities.

Transfer Applicants

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

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

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

READMISSION

If you are a former UCD undergraduate student planning to return to the UC Davis, you must file an Application for Readmission available in the Office of the Registrar, with a nontransferable, nonrefundable fee of \$40. (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 1991	August 23, 1991
Winter 1992	December 6, 1991
Spring 1992	February 28, 1992
Fall 1992	August 21, 1992

SPECIAL PROGRAMS

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 the Academic Advising and Student Resources section.)

Concurrent Enrollment

Concurrent courses are regular University courses open to the community on a space-available basis through UC Extension. 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, Research Park, University of California, Davis 95616, 916-757-8777.

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

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

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

Limited Status

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

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

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

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

Second Baccalaureate

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

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

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

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 and the College of Letters and Science.

ADMISSION CHECKLIST

- 1. Obtain the undergraduate admissions packet from your high school, a community college, or a campus of the University of California. If you are not a California resident, request an application from the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, CA 95616.
- 2. Complete the application including the essay and list the college and major you prefer. Attach a check or money order to cover the application fee with your application materials, and return them in the preaddressed envelope **during the priority filing period for the quarter in which you are interested.**
- 3. **Keep a copy of your application and essay.**
- 4. Retain for your records the notices received from both the Undergraduate Application Processing Service and the Undergraduate Admissions Offices which acknowledge receipt of your application.
- 5. If you are applying from high school, do not send a preliminary transcript unless requested to do so by Undergraduate Admissions. If you are applying as an advanced standing student, arrange to have all official transcripts sent. If test scores are required, please arrange to have these forwarded by the testing agency.
- 6. High school applicants to the fall quarter should make arrangements to take the SAT or ACT and three Achievement tests by no later than December. We strongly encourage that these tests be completed by the November test date.
- 7. 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, official transcript (if required), work in progress, and test scores (if required), therefore it is important to make arrangements for these requests if you want to avoid delay in the processing of your application.
- 8. If you are admitted, keep your admission letter for your records.
- 9. Return your "Statement of Intent to Register" (SIR), "Statement of Legal Residence," and Student Address form along with the nonrefundable advance deposit of \$100 (if required), as soon as possible and no later than the date stated on the SIR so your registration materials can be ordered before you register.

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.

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

Undergraduate Student Fees

University registration fee	\$231.00
Memorial Union fee	28.50
Associated Students fee	23.50
Optional undergraduate health insurance fee	(118.00)
Educational fee	527.00
Total for California residents	\$928.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$3,494.00

Graduate Student Fees

University registration fee	\$231.00
Memorial Union fee	28.50
Graduate Student Association fee	4.50
Health Insurance fee	104.00
Educational fee	527.00
Total for California residents	\$895.00

Tuition for nonresidents	2,566.00
Total for nonresidents	\$3,461.00

These are the proposed fees for the 1991-92 academic year. Because they are subject to legislative and gubernatorial action, these fees may change without notice.

Important Fee Exceptions

The Graduate Student Association fee is optional for students in the Schools of Law, Medicine, and Veterinary Medicine. (Law students are required to pay a Law Student Association fee of \$5.00 per semester.)

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

The Undergraduate Health Insurance plan is available to all undergraduates, except for foreign undergraduate students who must pay the Graduate Student Health Insurance fee.

Additional Fees and Expenses

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

Parking (per year: \$72 to \$204 for cars, depending on the type of permit; \$60 for motorcycles; \$72 for night-time only permit, i.e., \$17 per quarter)

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

For details concerning fees and deposits, consult the publication *1991-92 Student Fees and Deposits*, available from the Office of the Registrar. Current fees are also published in the *Class Schedule and Room Directory*.

Costs for a Year at UCD

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.

Average Student Costs Annually

Undergraduate

Fees	\$2,430
Books and Supplies	\$703
Housing	\$3,446
Food	\$1,311
Personal Expenses	\$1,829
Transportation	\$727
Total (off-campus residence)	\$10,446

Additional for living on campus

Total (on-campus residence)

Graduate (Single, living off campus)

General	\$10,986
School of Law	\$11,600 to 11,489
(depending upon the year in school)	
Graduate School of Management	\$11,354
School of Medicine	\$13,601 to 16,563
(depending upon the year in school)	
School of Veterinary Medicine	\$11,174 to 12,987
(depending upon the year in school)	

The awards for married students are based on the same basic budget plus the addition of a standard child care allowance, unless documentation is provided about a spouse who is unable to work, in which case a dependent living allowance will also be awarded. Single parents' awards are based on the single student's budget and a child care allowance. If single parents' resources (earnings and benefits) are not sufficient to meet the basic living expenses of their dependents, a standard dependent living allowance may be awarded upon receipt of documentation.

Employee-Student Fees

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. Employee students on the semester system may enroll for up to six units or two courses, whichever is greater. Detailed information is in the UC Staff Personnel Policy Manual (Section 260.23 for employees, 775.7 for retirees, and 141.11 for the Administrative and Professional Staff program) available in department offices, at the Library Reference Center, or the Staff Development and Professional Services Office. Petitions can be obtained through the employee's unit.

International Student Expenses

Careful budgeting is essential for international students. A minimum allowance of \$20,000 (or more based on proposed fee increases) 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.

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.

Fee Refunds

If you have to withdraw before the first day of instruction, you must complete a Cancellation of Registration form which is available from the Office of the Registrar. After the first day of instruction, you must fill out a Petition for Withdrawal which is also available at the Office of the Registrar.

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

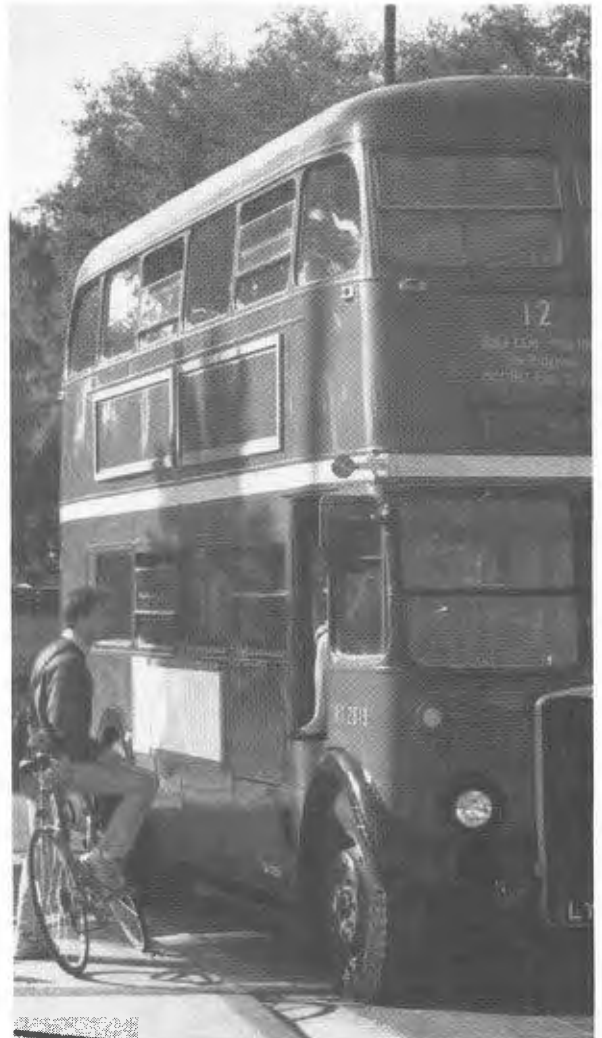
The Schedule of Refunds refers to calendar days beginning with the first day of instruction. Percentages listed (days 1-35) should be applied respectively to tuition, education fee, university registration fee, and other student fees. The effective date for determining a refund of fees is the date the 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%

Refund of Health Insurance Fee

If you paid the health insurance fee, and you are cancelling your registration before the first day of instruction, you will be refunded 100 percent of this fee. After the first day of instruction, no refund of the health insurance fee will be issued. Any questions regarding the refund of this fee for withdrawals should be directed to the Student Health Center.



FINANCIAL AID

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

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

Students who miss the priority filing date may not receive funds to meet their full need. However, you should still apply for financial aid even after the priority deadline because application processing will continue until funds are depleted. The Student Aid Application for California (SAAC) is available at local high schools, community colleges, and the Financial Aid Office. Continuing UCD students and prospective graduate students should obtain the SAAC and "Financial Aid—How to Apply, 1991-92" from the Financial Aid Office in December.

Financial Aid Deadlines

Priority filing period for grants, loans, work-study, and California Student Aid Commission applications for 1991-92	Jan. 1-Mar. 2
Deadline to file for fellowships and graduate scholarships for 1991-92 with the Graduate Division	Jan. 15

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

Graduate students are eligible for most of the same types of financial aid as undergraduates. In addition, graduate scholarships, fellowships, and teaching and research assistantships are administered through the Graduate Division. Eligibility for state graduate fellowships is based on grade-point average, test scores, and financial need. Awards are applied directly toward fees.

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

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

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

TYPES OF FINANCIAL AID**Grants**

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

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 "Student Aid Report" (SAR). All parts of the SAR must then be submitted to the UC Davis Financial Aid Office. The amount received 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 for entering undergraduate students primarily from low-income backgrounds. Recipients are required to complete at least 12 units each quarter, unless the student receives permission to enroll for fewer units.

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

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

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

Supplemental Educational Opportunity Grants are awarded on the same basis as University Grants 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. Applicants should also write to the agency which administers their tribal affairs and request a BIA Higher Education Assistance application. The BIA Financial Aid counselor on campus can assist you with completing the application.

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

Loans

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

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

- \$4,500 undergraduate maximum for first 2 years
- \$9,000 undergraduate maximum during 4 years

34 Fees, Expenses and Financial Aid

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

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

- \$4,500 undergraduate maximum for first 2 years
- \$9,000 undergraduate maximum during 4 years
- \$18,000 maximum for graduate students, including loans for undergraduate studies
- 5 percent interest (subject to change)

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

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

Stafford Student Loans are available through banks and other lending institutions. These loans are based on financial need. Interest accrued while the student is 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 six 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 for interest

- Interest is set at 3 percent points above 91-day T-Bill rates
- Repayment begins nine months after completion of formal training, including accredited internship and residency programs or withdrawal

Parent Loans to Assist Undergraduates (PLUS) and Supplemental Loans to Assist Students (SLS) 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 and professional students may borrow \$4,000 per year to a maximum aggregate of \$20,000 for each dependent student
- Independent undergraduate students or graduate and professional students may borrow up to \$4,000 per year to a maximum aggregate of \$20,000
- There is no interest subsidy for this loan
- Repayment begins 30 days after loan disbursement

Quick Loans, Short-Term Loans, Teaching and Research 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.

- Quick loan: \$200, or fee payment and \$200; no appointment is required. Pick up the application and drop it off at the Financial Aid Office during the hours posted in North Hall. Return in 24 to 48 hours to obtain the loan.
- 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 five months.
- Teaching assistant loan: students who are in the teaching assistant, research assistant, associate-instructor, and postgraduate researcher classifications can apply for a maximum of one month's salary before and during fall quarter. The maximum repayment period is six months.
- Applications for Short-Term Loans, Quick Loans, or Teaching and Research Assistant Loans are available in the lobby of North Hall. For more information or to schedule an appointment, call 916-752-6470, 10 a.m. to noon and 2 to 4 p.m.

Work-Study

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

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 California residents.

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

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

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

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

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

Regents Scholarships, among the highest honors that undergraduates at the University can receive, are granted to exceptionally promising freshmen or juniors enrolling in the fall quarter. Awards may be honorary (a \$500 per year award) or may be accom-

panied by a stipend generally covering the difference between family resources and yearly educational costs. The Regents Scholarship 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.

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

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

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

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

- Generally \$100 to \$2,000

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

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

Student Life



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 4,300 undergraduates and 178 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. About 90 percent of the freshman students live in residence halls. Twenty-five percent of the transfer students elect to live in a residence hall environment. All new undergraduates whose applications are received on or before April 1, 1991, are guaranteed residence hall housing as long as they complete all of the instructions which accompany their contracts. All graduate students whose applications are received on or before May 1, 1991, will participate in a lottery for the 178 spaces available in Lysle Leach Hall.

The total room-and-board rate for 1991-92 is \$5,015 for a double-occupancy room and \$5,505 for a single room (of which there are very few available to new residents). Rooms are furnished to provide each resident with a bed, desk and chair, bookcase, chest of drawers, study lamp, and bulletin board. Two meal options are available.

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 Student Housing Office. If you have a physical disability which requires special housing accommodation, please attach a detailed letter of explanation to your application.

Student Family Housing

Information:
Student Family Housing Office
Orchard Park/Solano Park
916-752-4000

There are 476 furnished and unfurnished on-campus apartments for UCD student families. The monthly rates for the academic year 1990-91 were as follows:

- Orchard Park, two-bedroom unfurnished apartment, \$381.
- Orchard Park, two-bedroom furnished apartment, \$405.
- Solano Park, one-bedroom unfurnished apartment, \$286.
- Solano Park, two-bedroom unfurnished apartment, \$324.

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 eight 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.

Russell Park

Information:
916-753-7322

Privately owned and managed on-campus living accommodations are available for student families. Russell Park features one-, two-, and three-bedroom unfurnished units. Monthly rents for academic year 1990-91 ranged from \$390 for a one-bedroom unit to \$630 for a three-bedroom unit.

Other Graduate Student Housing

Information:
The Atriums
916-753-0659

The Atriums offers on-campus living accommodations for single graduate students. The *privately owned and managed* apartments feature studio and two-bedroom unfurnished units. For the academic year 1990-91, monthly rent for a studio was \$409 and \$570 for a two-bedroom unit.

Community Housing

Information:
Student Housing Office
916-752-2483

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.

STUDENT SERVICES**Student Health**

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

Your health is important to you and to the University. Consequently, every new full-time student and every full-time student who returns after an absence must submit a medical history form, and evidence of rubella 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
- 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.

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

Child Care Programs

Need help with child care? The following programs are available on campus and in the community to help you meet your 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 Kids On Kampus, Russell Park Child Development Center, and the City of Davis Child Care Services Program. For further information, contact Community Housing, 101 Student Housing Office, or telephone 916-752-2483.
- The City of Davis Child Care Services Program provides free child care resource and referral information and information on child care subsidies in the community. The program 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 on licensed family day care homes, day care centers, nursery schools, co-ops, playgroups, and other family-related services. Additional services include workshops and handouts; a bimonthly newsletter; a parenting resource library; and a book, video, and toy lending library. It is located at 23 Russell Boulevard, 916-757-5626.
- The UCD Registration Fee Child Care Subsidy Program assists full-time students with partial child care subsidies. Spouses must also be full-time students or employed full time. Eligibility is based on family income, with awards determined by lottery. Parents can choose from licensed family day care providers and child care centers. For additional information,

call City of Davis Child Care Services Program at 916-757-5626 or drop by 23 Russell Boulevard.

- The Child Care Grant Program, funded by the California Department of Education and administered by the City of Davis Child Care Services Program, provides subsidized care on a sliding fee schedule. Waiting list applications are accepted year round. Admittance is based on income and priority guidelines set by the State. For information call 916-757-5626, or drop by 23 Russell Blvd.
- The Financial Aid Office can assist students who are parents and who qualify for financial aid with allowances for direct child care costs (in-home provider or child care center charges). This office is in 113 North Hall, 916-752-2390.
- The Student Employment Center posts job listings of parents wishing to hire child care providers and of providers interested in serving students, staff, and faculty. This office is in 114 South Hall, 916-752-0520.
- Kids On Kampus and Russell Park Child Development Center are privately owned and operated child care centers on the UC Davis campus. Reduced rates are given to residents of Russell Park, Orchard Park, and Solano Park student family housing. Information about Kids on Kampus, serving infants through preschool, can be obtained at 916-753-8716. Information about Russell Park Child Development Center, serving infants through school-age children, is available by calling 916-753-2487.
- The Early Childhood Laboratory is a teaching and research facility 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 lower tuition than do UCD staff, faculty, and community-affiliated families. Children are selected from a waiting list according to criteria designed to meet academic goals. The laboratory is located on campus, and the office is in TB 117, 916-752-2888.
- 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. 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 Perfect Tender infant care cooperative serves six infants under twelve months of age whose parent(s) attend the School of Law. Contact 916-752-0243 for additional information.
- The Women's Resources & Research Center provides a free child emergency notification service for single parents and others with special circumstances. Once registered, the parent will be located and contacted in class in the event of a serious, health-related emergency involving her/his child. The Center is located in 10 Lower Freeborn, 916-752-3372.

Student Employment

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

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

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

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

The Center is open from 8:30 to 11:45 a.m. and from 1:00 to 4:00 p.m.

Transportation and Parking

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

Campus Shuttle. The TAPS (Transportation and Parking Services) Intracampus Shuttle System provides service to the central campus area. Other TAPS shuttles provide service to the UCD Medical Center, Research Park, and University facilities on Chiles Road.

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



Ridesharing. Ridesharing is encouraged. Information on transportation alternatives to the Davis campus is available by calling 916-752-MILE or by visiting the Transportation and Parking Services Office located on Extension Center Drive. Information may be obtained on carpooling and vanpooling (registered pools receive reduced parking rates as well as preferential parking), public transit, commuter match assistance, and shuttle systems.

RECREATION AND THE ARTS

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

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

Memorial Union and Campus Recreation

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

The **Memorial Union (MU)** complex, directly north of the Quad, serves as the community center for the campus by providing campus services and a variety of extracurricular activities. Bring yourself up to date on local events by stopping at the MU Campus Information Center in Griffin Lounge on the main floor. A valuable resource for current students as well as new students and visitors, the Center can also be reached by telephone, 916-752-2222. Other first-level facilities include the UCD Bookstore, Corral gift shop, and Coffee House.

King Lounge on the second floor features music listening and periodicals in a comfortable and relaxed atmosphere popular for studying. The MU Art Gallery and a complex of meeting rooms, the MU II Conference Center, complete the second floor. In addition to the administrative offices of the Memorial Union and Campus Recreation, the offices of ASUCD, Campus Events and Information, and Student Activities and Judicial Affairs can be found on the third and fourth floors of the MU tower. Freeborn Hall is a 1,250-seat assembly hall used for dances, performing arts, banquets, lectures, and conferences. The UC Davis Presents 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 an inviting open-air seating environment.

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 **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 916-752-2885/1730.

The **Games Area**, located below the UCD Bookstore, is a recreational facility consisting of a bowling center, billiards room, video arcade, lounge, 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 fully accessible to the disabled. Call 916-752-2580/1730 for details.

Two special programs of the Memorial Union, the **MU Campus Information Center** and **Leisure Education Programs** promote balanced, healthy living. Through information and referrals, the Center links people and their interests with appropriate resources. The Center is open weekdays from 8:00 a.m. to 5:00 p.m., or call

916-752-2222. Leisure Education Programs offer a variety of presentations on personal balance and well-being as well as recreational opportunities available on campus. Presentations are available for your group by calling 916-752-1730.

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

Outdoor Adventures, in the Barn on the corner of California and Hutchison, is a valuable resource 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, mountaineering, cross-country skiing, and other sports are offered throughout the year. Group rates and custom-designed trips can be arranged. Many special activities such as wilderness emergency-care clinics, white-water river guide training, slide presentations, and programs conducted by outdoor experts are also held. Stop in and share your own outdoor experiences! For more information call 916-752-1730.

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, summer equestrian camps, and special events, and also coordinates the Polo and Equestrian Clubs for student participation. Telephone 916-752-2372/1730 for further details.

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

The **Silo Union**, recently renovated to serve a variety of campus needs, offers food services, meeting/conference facilities, lounges, and the campus pub. If you

would like to reserve space in the Silo for a meeting, social event or conference, contact Campus Events and Information at 916-752-2813.

The **Craft Center** in the South Silo is an ideal place to channel your creative energy. Facilities are available on a drop-in basis, or 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, ceramics, photography, silkscreen printing, welding, leatherworking, and stained glass. More information can be obtained by calling 916-752-1475/1730.

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



Recreation Hall

Information:
Entrance 1B
916-752-6073

Recreation Hall is a multi-use arena available for intramural and informal recreation play, intercollegiate athletic basketball and women's gymnastics, physical education classes, sports clubs, and special events. The tri-level facility has locker rooms; a flat running track; an equipment room; racquetball, wallyball, and squash courts; a weight room with free weights, universals 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. The Special Events Room can be reserved for meetings by calling the Campus Events and Information Office.

Students can use Rec Hall facilities by showing their current, valid photo ID card. They may also purchase a \$5.00 guest pass valid for three people. Nonstudents may purchase a privilege card at Rec Hall to use lockers, equipment, and facilities. Patrons may also purchase a daily pass at the 1B entrance. Rec Hall is open Monday through Friday from 6:00 a.m.–midnight, Saturdays 9:00 a.m.–6:00 p.m., and Sundays noon–10:00 p.m. throughout the year. Rec Hall hours are shortened during quarter breaks and summer.

Numerous special events sponsored each year by the campus and community are held in the 8,400-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 cannot be reserved and are available on a first-come, first-served basis.

Intercollegiate Athletics, Intramurals and Club Sports

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

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

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

The club sports program includes both recreational and competitive offerings involving 37 sports with 2,100 participants per year, while the intramurals program provides competition in 36 sports and serves approximately 14,000 participants.

The Arts

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

UC Davis Presents (916-752-2523), located in Freeborn Hall, brings a wide variety of touring performing artists to UC Davis to serve both the campus and surrounding communities. During the academic year, UC Davis Presents offers concerts and recitals by classical, jazz, and folk music artists; drama; classical, modern, and ethnic dance; and lectures by eminent public figures. Various departments such as English, the foreign languages, and history sponsor lectures, poetry readings, and exhibits open to the University community. Bulletin boards, kiosks, the student radio station KDVS, and the *California Aggie* advertise programs and local events.

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

Music

The Department of Music (916-752-0666) sponsors the UCD Symphony Orchestra, Chorus, Chamber Singers, Early Music Ensemble, Concert Band, and small ensemble groups. Music majors and other interested students can receive credit for participation in these groups, which perform at concerts and recitals open to the University community. The department 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 UC Davis Contemporary Music Players and the UCD Faculty Woodwind Quintet are in residence on campus. The Department of Music sponsors nearly one hundred public concerts each year.

Drama

The Department of Dramatic Art has one of the best theater facilities in California. The excellent faculty and the Granada Artists-in-Residence program (which brings a major British director to the department each quarter); graduate students working on Master of Fine Arts (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.

Art Galleries

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

The **Design Gallery** (916-752-6223) on the first floor of Walker Hall is known for its exciting exhibitions of design-related material. Changing presentations and installations of architecture, interiors, graphics, costumes, textiles, folk art and the annual Picnic Day Student Exhibition reflect the interests of the design program. The Design Gallery is an innovative space where the installations are as interesting as the material presented.

The **Richard L. Nelson Gallery** (916-752-8500), named in honor of the first chairperson of the Department of Art, was dedicated in 1976. Located on the first floor of the Art Building, the Gallery organizes reg-

ularly changing exhibitions of historical and contemporary works of art. The Gallery's program reflects and complements the teaching program of the Department of Art and provides aesthetic enrichment to the University community and the Northern California area at large. The **Fine Arts Collection** (916-752-8500) is located adjacent to the Nelson Gallery. Representing various historical periods and cultures, it is the Davis campus's major collection of art. Selected works are available for viewing weekday afternoons. The student-run **Basement Gallery** (916-752-0105 to leave a message) in the Art Building features art work by undergraduate UCD art majors. The work changes weekly.

The **C. N. Gorman Museum** (916-752-6567, Native American Studies), located in Hart Hall, 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 art and artifacts are also exhibited on a rotating basis throughout the year.

ASSOCIATED STUDENTS (ASUCD)

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

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

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

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

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

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

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

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

ASUCD operates more than 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 ASUCD 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, the Bike Barn repair services, travel service, free legal advice for undergraduate students, 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 Campus Copies, *The Third World Forum* newspaper, 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, as well as a full-time student lobby on the national level to represent student interests on such matters as financial aid.

GRADUATE STUDENT ASSOCIATION (GSA)

Information:
Room 253, South Silo
916-752-6108

GSA is the officially recognized student government for UC Davis graduate students. It links graduate students to each other and to the UCD administration. GSA provides a place for discussion of any issue affecting graduate student academics or quality of life. Every graduate program should elect or designate GSA representatives to advocate graduate student concerns effectively.

General Assembly meetings are held once a month and are open to anyone interested in attending. Each

year several graduate students are elected to the GSA Executive Council in a variety of positions to carry out the policies and/or functions of the organization. A small portion of your registration fees is used to support the activities of GSA. GSA provides advocacy, services, and information to all graduate students, and in turn, needs your participation. Please call or visit the GSA office.

STUDENT ACTIVITIES

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

There are over 300 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, Activities Faire, Leadership Training Programs, and national collegiate leadership awards competitions. 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.

Cultural Days is an annual series of programs celebrating the diverse ethnic cultures of the university community. They include African American Family Festival, Asian Pacific Cultural Week, Semana de la Raza, and the Native American Powwow. Everyone is invited to share in these programs featuring speakers, workshops, films, entertainment, and family events.

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

JUDICIAL AFFAIRS

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

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

ble 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 during registration. 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; harassment, including "fighting words"; forgery; theft; vandalism; illegal possession, use, or sale of drugs or alcohol; 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 Office of Student Judicial Affairs. If complaints cannot be resolved informally between Student Judicial Affairs, the accused student, and the referring party, the case may be referred to a hearing before the Student Conduct Committee, Campus Judicial Board, or a hearing officer. The president of the University, through the chancellor, has ultimate authority for the administration of student discipline.

Student Responsibilities

You are responsible for 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.

ALUMNI ASSOCIATION

Information:
Cal Aggie Alumni Association
UC Davis
Davis, CA 95616
916-752-0286
Toll free in California 1-800-242-GRAD

After graduation you can continue your association with UC Davis through membership and participation in the Cal Aggie Alumni Association.

The Association and its alumni members support UC Davis through support and sponsorship of many activities and programs. Sustaining membership in the alumni association is only \$20 per year for first year graduates. Members are afforded the many special programs and benefits of the Association. Call the alumni association for more information or drop by the alumni office before you graduate.

Academic Advising and Student Resources



ACADEMIC ADVISING

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

College of Agricultural and Environmental Sciences

Office of the Dean

228 Mrak Hall
916-752-0108

The Dean's Office provides you with

- Academic advising: advice regarding probation/dismissal status, admission to the College, readmission, and second bachelor's, limited, and regular status.
- Action on petitions that require the Dean's approval.
- Additional services include: study plan clearance; College English requirement check; release of holds on registration packets; final evaluation for graduation; evaluation of Transfer Core Curriculum.
- A Special Events unit responsible for the College Commencement Program.

Departments and Advising Centers

Faculty Advisers. You will be assigned a faculty adviser to help you plan a program that corresponds to your individual educational interests. The Master Advisers are responsible for coordinating advising within a major. You are strongly urged to consult with your faculty adviser or staff 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. Advising on academic programs is available at the College's Academic Advising Center, 122 Hoagland Hall, where advising activities in the College are coordinated.

The primary advising function is advising for students in the Exploratory Program. Advising for Individual Majors is also carried out in the Academic Advising Center.

There are numerous Advising Centers staffed by Advising Associates who are knowledgeable in all aspects of University and College rules and regulations, courses, specific requirements of majors, and career opportunities. Following is a list by major.

ANIMAL SCIENCE

Majors in Animal Science

Animal Science
Avian Sciences
Wildlife and Fisheries Biology

Advising Centers:
1202 Meyer Hall, 916-752-6118 (Animal Science only)

3202 Meyer Hall, 916-752-1300 (Avian Sciences only)

Interdisciplinary Major

Agricultural Science and Management
Advising Center: 1202 Meyer Hall, 916-752-6118

APPLIED ECONOMIC AND BEHAVIORAL SCIENCES

Majors in Applied Economics

Agricultural and Managerial Economics
Advising Center: University House Annex, 916-752-6185

Majors in Behavioral Sciences

Agricultural Education
Applied Behavioral Sciences
Design
Human Development
Landscape Architecture

Advising Centers:
101 or 103 AOB 4, 916-752-2244
152 Walker Hall, 916-752-1165 (Design; Landscape Architecture only)

BIOLOGICAL SCIENCES (an Intercollege Division)

Majors in Biological Sciences

Biochemistry
Biological Sciences
Botany
Genetics
Microbiology
Physiology
Zoology

Advising Centers:
376 Mrak Hall, 916-752-0410 (Biological Science only)
196 Briggs Hall, 916-752-9696 (Animal Physiology only)
149 Briggs Hall, 916-752-9032 (Biochemistry only)
151 Robbins Hall, 916-752-4749 (Botany only)
2320 Storer Hall, 916-752-7488 (Zoology only)

FOOD, NUTRITION, TEXTILE AND CONSUMER SCIENCES

Majors in Food Sciences

Consumer Food Science
Fermentation Science
Food Biochemistry
Food Science

Advising Centers:
128 Cruess Hall, 916-752-1468 (Consumer Food Science, and Food Science only)
2467 Chemistry Annex, 916-752-6168 (Food Biochemistry only)
3001 Wickson Hall, 916-752-1909 (Fermentation Science only)

Majors in Nutrition

Community Nutrition
Dietetics
Nutrition Science

Advising Center: 1151 Meyer Hall, 916-752-2512

Majors in Consumer Sciences

Fiber and Polymer Science
Textiles and Clothing

Advising Center: 129 Everson Hall, 916-752-4417

PLANT SCIENCES AND PEST MANAGEMENT

Majors and Programs in Plant Sciences

Plant Science
Range and Wildlands Science

Advising Center: 132 Hunt Hall, 916-752-1715

Major in Pest Management

Entomology

Advising: 394A Briggs Hall, 916-752-0490

Interdisciplinary Major

Agrarian Studies

Advising: 2039 Wickson Hall, 916-752-0926

RESOURCE SCIENCES AND ENGINEERING**Majors in Environmental Studies**Environmental Biology and Management
Environmental Policy Analysis and Planning

Advising Center: 2134 Wickson Hall, 916-752-3088

Majors in Resource SciencesAtmospheric Science
Environmental Toxicology
Resource Sciences
Soil and Water Science

Advising Centers:

122 Hoagland Hall, 916-752-1669

4111 Meyer Hall, 916-752-1042 (Environmental Toxicology only)

Major in Agricultural Engineering

(See College of Engineering)

Interdisciplinary Major

International Agricultural Development

Advising Center: 101 AOB 4, 916-752-2244

Peer Advisers. Student advisers are available in the College's Academic Advising Center and at other advising centers around campus.**Associate Deans of Resident Instruction and Student Affairs**

Associate Deans:

Ericka L. Barrett

Shu Geng

228 Mrak Hall

916-752-0108

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.

Exploratory Program (non-degree program)

College Academic Advising Center:

122 Hoagland Hall, 916-752-0610

Are you unsure what major you really want to pursue? If so, you may wish to register in the Exploratory Program. With the assistance 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 abilities, and ultimately select the major best suited to your needs. A major must be declared before you complete 120 units (see Declaration of Major). For registration purposes, indicate "Exploratory" on your admissions materials.

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 edu-

cational 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.

College of Engineering**Departments and Advising Centers**

Undergraduate Office (2132 Bainer Hall). By contacting the Undergraduate Office, you may obtain information and assistance on academic, career, and personal matters either through direct assistance with one of the staff members or through referral to other offices on campus. The Undergraduate Office has primary responsibility for student petitions, for evaluation of transfer units, for articulation, and for degree certifications.

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

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

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

To facilitate dialogue with your adviser on your program of study, use the Advising Worksheets. Extra copies are available in the Undergraduate Office. You should work out your Lower Division Worksheet early in your freshman year, have your adviser sign it, and then review it 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.

Peer Advisers. Faculty advising is complemented by a well-developed peer advising system. Student advisers are available at Bainer Hall and at other locations described in the Other Academic Advising section of this chapter.

College of Letters and Science**Office of the Dean/
Letters and Science Advising Office**

150 Mrak Hall

916-752-0392

The Associate Deans and staff in the Letters and Science Advising Office are available to assist you with a wide variety of issues relating to your academic goals and experiences. Individual consultation is provided on matters such as program planning, selection of a

major, exceptions to regulations and academic enrichment opportunities. The office also provides a number of additional services:

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

Departments and Advising Centers

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

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

Continuing students who have completed three quarters in residence in the College are no longer obligated to consult an adviser except at checkpoint stages (below); 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.

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

Advising Checkpoints. You 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 graduation requirements. You must also have declared a major by this time. Filing this plan with your adviser does not preclude subsequent modifications of the plan or a change of major.
- When you complete 135 units of degree credit, including transfer work, you should obtain a Degree Check from the Letters and Science Advising Office and consult your adviser concerning course selec-

tion and satisfaction of requirements in the major.

- Before you complete 195 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a firm study plan, in the form of a quarter-by-quarter program that will satisfy all remaining degree requirements as expeditiously as possible. This plan will be filed with your adviser. If the plan indicates that you will have to register beyond the 225-unit limit in order to 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.

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

Division of Biological Sciences

The Division of Biological Sciences Office

376 Mrak Hall
916-752-0410

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

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

Departments and Advising Centers

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

OTHER ACADEMIC ADVISING

Academic Peer Advising

Academic Peer Advising places peer advisers in over 45 departments to help students find the answers to their questions about major requirements, courses, and University regulations. The academic peer adviser complements faculty advising by providing a student perspective on the department. The Academic Peer Advising staff is trained to provide information and assistance concerning graduate schools, career opportunities, and college requirements. For more information contact the main APA office in 108 South Hall, 916-752-3000.

The First Resort

The First Resort is a place to go if you are feeling bogged down by University red tape, registration pro-

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

Orientation and Summer Advising Office

The Orientation and Summer Advising Office 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, 916-752-3000.

Advising Services

The **Pre-Business School Adviser**, 108 South Hall (916-752-3000), 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., Ph.D., or teaching credential programs. Specific services include help in locating graduate school programs in specific fields, completing application forms and statements of purpose, and planning financial options. Advisers are available through the main Advising Services office, 108 South Hall, 916-752-3000.

The **Pre-Law Advising Office** is where students interested in legal profession can come for information. The staff can advise you about admission requirements and program planning. The office maintains a reference library of law school bulletins, legal assistant information, admission test materials, and general career information. 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, 916-752-3009.

The **Health Sciences Advising Office**, 106 South Hall (916-752-2672), will be an important place for you if you are preparing for a profession in the health science area. The professional staff and student advisers

can provide information on requirements, application procedures, professional school curricula, and related options. The office maintains an extensive library of school catalogs, statistics, and books and journals related to health education.

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

Information:
313 North Hall
916-752-3472

The Educational Opportunity Program/Student Affirmative Action Information Office serves EOP/SAA students by assisting them with their academic, social, and personal adjustments to the University environment; 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.

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

Academic Reentry Program

Information:
175 Mrak Hall
916-752-2971

If you are a nontraditional student, you can find help through the Academic Reentry Program which offers preadmission and reentry advising. 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.

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. Reentry/Transfer Student Services assists admitted students in connecting with campus resources and support groups.

ACADEMIC HELP

Learning Skills Center (LSC)

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

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

- General study skills
- Math/science study skills

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

In addition to the above areas of assistance, the Center provides individual tutoring sessions for 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, MCAT, and LSAT exams, many of which may be checked out.

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

EOP/SAA Tutoring

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

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

Special Transitional Enrichment Program (STEP)

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

New EOP/SAA students (freshmen 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 Resource Centers

Information:
Student Housing
Lora Jo Bosslo
916-752-1736

Learning Resource Centers are located in the Segundo, Tercero, and Cuarto residence hall areas. They offer the

following services to all residence hall students: tutoring, PC computer terminals and assistance, a reference library, language tapes, study sessions, special learning skills programs, an exam file, and a quiet place to study.

RESOLVING ACADEMIC PROBLEMS

The Grievance Process

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

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

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

ASUCD Grievance Center

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

The ASUCD Grievance Center advocates students' academic concerns to the faculty and administration. Grievance counselors deal with students one-on-one, directing them to appropriate channels through which to state their grievances (i.e., student-faculty relations, sexual harassment, grade change problems, and prejudicial treatment in the classroom.)

Committee on Student-Faculty Relationships

Information:
Academic Senate Office
356 Mrak Hall
916-752-2231

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

Student Judicial Affairs

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

Student Judicial Affairs supports the standards of the campus by responding to alleged violations of University policies or campus regulations. In addition, the office coordinates the informal resolution process and receives formal complaints for student grievances based on impermissible discrimination or harassment

(sexual, racial, religious, handicap, etc.), or on violations of student rights to obtain access to or prevent disclosures from their campus records. The office also serves as a resource for conflict resolution and it can provide interpretations of University policies and regulations.

STUDENT SERVICES

Counseling Center

Information:
219 North Hall
916-752-0871

The Counseling Center offers confidential psychological, psychiatric and peer counseling services to students having problems which affect their academic progress and sense of well-being. 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: 916-752-2790
Business Line: 916-752-5665

Located in a green, two-story 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 relationship problems. The facility is staffed by well-trained student volunteers and is professionally managed.

Students can receive assistance through individual peer counseling and a wide variety of workshops and support groups. 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.

Associate Dean of Students

Information:
1st Floor, South Hall
916-752-2019

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 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.

Health Education

Information:
Cowell Student Health Center
916-752-9652

Because maintaining good health is vital for the successful pursuit of your educational goals, the Health Education Program provides information and services



through three programs. Trained peer counselors, workshops, and resource libraries are available through:

Drink Responsibly in College (916-752-DRUG or 752-3784)—Information on alcohol and other drugs, support and referral for students who have or know someone with a substance abuse problem.

Health Advocates (916-752-9651)—Information on nutrition, exercise, stress management, eating disorders, and other wellness issues.

Peer Counselors in Sexuality (916-752-1151)—Information on birth control, pregnancy, sexually transmitted diseases, sex roles and other sexual issues.

International Student Services (SISS)

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

The functions of the SISS Office are to assist incoming international students and scholars in making preparations to come to the U.S., to orient them 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. In addition, immigration, personal, cultural, and financial advising are provided.

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.

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.

Student Special Services

Information:
160 South Silo
916-752-2007

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

Disability Resource Center

Information:
Disability Resource Center (DRC)
160 South Silo
916-752-3184 (voice) or 752-6833 (TDD)

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

DRC was founded with a strong commitment to improving individual choices, personal control of essential resources, and integrated participation in campus life. All University students are assumed to have similar needs, but the consequences of a disability may include some specialized requirements. Therefore, we work closely with each student in identifying his or her particular needs.

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

- Alternative educational materials including large-print and taped textbooks
- Campus shuttle services
- Disability management counseling
- Emergency wheelchair repair
- Facilitation of access to all campus programs
- In-person registration assistance and priority enrollment
- Maintenance of a list of personal care attendants
- Peer support groups
- Reader and notetaker services
- Referral for special parking
- Referral for tutoring

- Referral to on-campus and off-campus resources, services and agencies
- Sign language, oral interpreting, and transliterating services
- Special adaptive equipment and computers

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

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

Draft Information

Information:
Student Special Services
160 South Silo
916-752-2007/2020

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

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

Transfer/Reentry Student Services

Information:
Transfer Student Services: 916-752-2200
Reentry Student Services: 916-752-2005
160 South Silo

The Transfer Student Services Office directly serves *enrolled* students who have transferred from other institutions of higher education. It provides information and assistance to ensure students an easy and smooth transfer to the University. It coordinates transfer student matters among existing student services units. It also sponsors special receptions and workshops for new transfers, links them to second-year transfers, publishes an annual *Transfer Guide* of available services and provides assistance to members of the Transfer Student Association.

The Reentry Student Services Office directly serves *enrolled* students who have reentered the university after several years of life and work experience. It provides information and referral assistance using the Reentry Resource Network. The Network is composed of representatives from existing student services units, colleges, and divisions who are designated to assist reentry students (e.g., Women's Resources and Research Center, Financial Aid, Student Housing, the Dean's Offices, etc.). It also sponsors special programs for new reentry students and provides assistance to members of Advocates For Reentry Students.

Veterans Affairs

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

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

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

Women's Resources and Research Center (WRRC)

Information:
10 Lower Freeborn
916-752-3372

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

The Center is staffed by friendly, knowledgeable 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.

INTERNSHIPS AND CAREER SERVICES

Internship Programs

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

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

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

The Internship and Career Center

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

If you are an undergraduate, graduate, or alumnus, ICC can assist you in (1) identifying your abilities and

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

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

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

Education and Graduate Placement Services

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

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.

Human Corps Program

Information:
The Internship and Career Center
227 South Hall
916-752-2855

Human Corps is a student community services program. Public service work can be a rewarding and satisfying experience which may also improve your qualifications for the job market. Service can be paid or non-paid and can take many forms, from a one-day activity to a long-term commitment.

The goal of Human Corps is to facilitate student involvement in community service by serving as a referral center for students wishing to volunteer and a resource for agencies looking for volunteers.

Academic Information



REGISTRATION

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

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

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 deadline will be allowed only under conditions where action or inaction on the part of the University delays registration. A recommendation from an appropriate administrative unit will be required, and the registration fee must be paid with cash, cashier's check, credit union check, University check, or fee exchange.

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

Change of Address. Change of Address forms are available at the Office of the Registrar.

ENROLLMENT IN COURSES

The *Class Schedule and Room Directory*, available several weeks before the beginning of each quarter, gives class hours and room numbers, changes to the *General Catalog*, and the most up-to-date information on registration and enrollment procedures.

Class Level

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

Class	Unit Breakdown
Freshman	0—40.0
Sophomore	40.1—83.9
Junior	84.0—134.9
Senior	135.0—

Undergraduate Courses

Lower Division Courses

These courses, **numbered 1-99**, are open to all students for lower division credit, but are designed pri-

marily for freshmen and sophomores.

Upper Division Courses

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

Variable-Unit Courses

Subject to 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.

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

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

Autotutorial Courses are courses in which students instruct themselves at their own pace. These courses can be identified by the letters AT on their course numbers, e.g., 1ATA-1ATB-1ATC, 105AT, 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 teacher-training courses in the Division of Education and in other departments and are especially intended for teachers or prospective teachers. Included are courses designed to provide instruction to teaching assistants. Also included are courses for certification of family nurse practitioners and physician assistants. These courses are open only to students enrolled in those programs.

Other Professional Courses

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

Prerequisites

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

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 card in order to add or drop courses after this initial enrollment. Cards 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 which is on your study list and for which you did no work that could be graded is reflected on your official transcript. A verification of your study list is available some time during the fourth week of each quarter.

Retroactive Drops

Occasionally, in exceptional circumstances, students are allowed to drop a course after the course is completed. Reasons for seeking a retroactive drop are very specific: medical problems, severe emotional difficulties, or death or severe illness in the immediate family. Petitions are available from the Office of the Registrar and should include a detailed account of the problem, appropriate documentation, and an adequate explanation of why an "I" grade or late drop was not taken during the quarter in which the problem occurred. The instructor's signature is required on the petition. A \$3.00 fee is applicable on all retroactive drops.

Retroactive Adds

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

COURSE LOAD

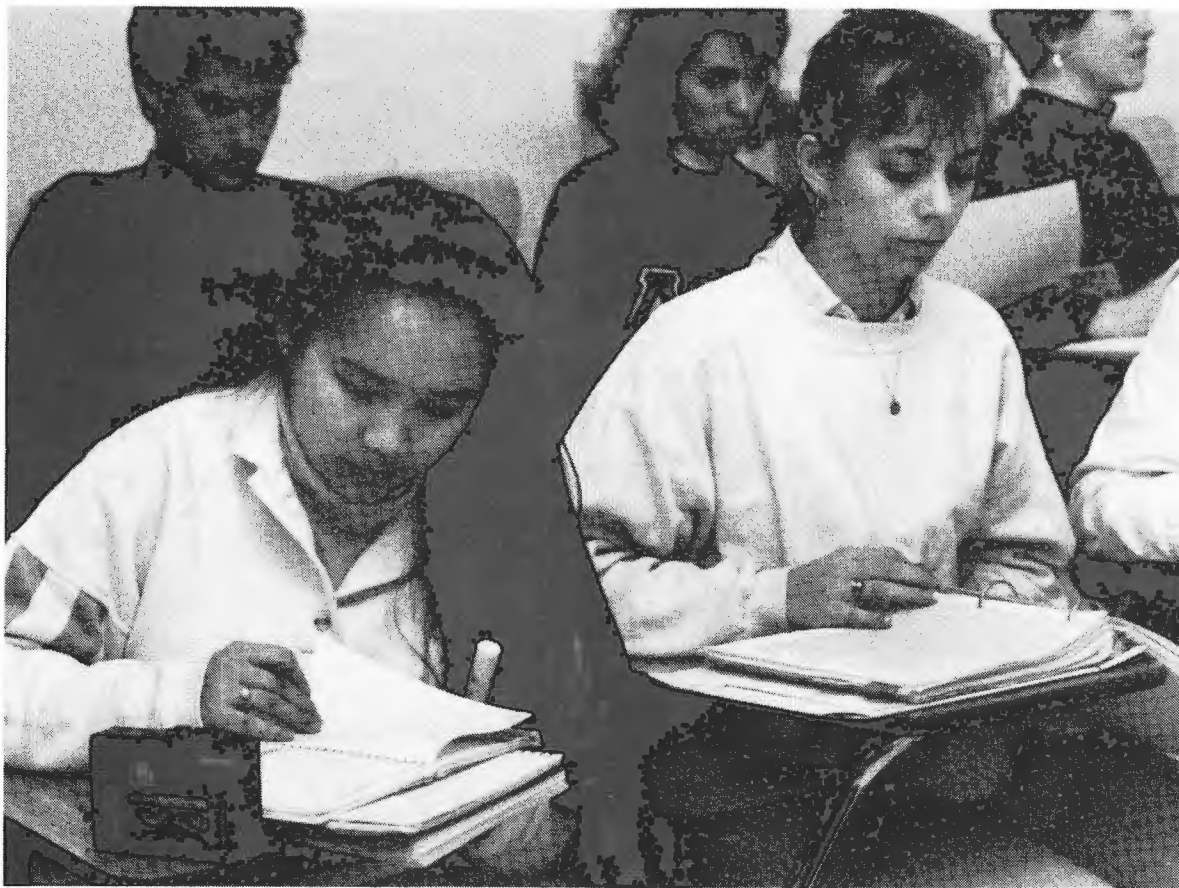
Certification of Full-Time Status. Undergraduate students must carry a study load of at least 12 units (including workload units) each quarter in order to be certified as full-time students for insurance and financial aid purposes, or to compete in intercollegiate athletics. Graduate students must carry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

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

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

PART-TIME STUDENT STATUS

If, for reasons of occupation, family responsibility, health, or, for one time only, graduating senior status, you are unable to attend the university on a full-time basis, you may qualify for enrollment in part-time status. Students may change status between full-time and part-time as their circumstances change. To be considered eligible, undergraduate students must be enrolled in ten units (including workload units) or fewer per quarter, and graduate students must be enrolled in six units or fewer per quarter. Minimum progress requirements are waived for part-time students. A petition, available at the Office of the Registrar, must be approved by the dean of your college (certain verifications are required), and then filed with the Office of the Registrar no later than the tenth day of instruction in the quarter of enrollment. Part-time students have use of the same facilities and are eligi-



ble for the same services, including Student Health Services, as full-time students.

ACADEMIC CREDIT

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

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

In most courses at Davis the standard procedure prevails, so that a three-unit course meets for three hours a week, a four-unit course for four hours, and so on. Courses that are an exception to this pattern may require additional class time or give more demanding assignments. If you have questions about the number of units assigned to a course you should check the expanded course descriptions (if your college or department provides them) or ask the instructor what is required in terms of outside reading, term papers, problem sets, or field trips. These are not always spelled out completely in the *General Catalog*. By

knowing the amount of work 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 \$5.00, must be presented for final approval to the dean of your college or school, or if you are a graduate student, to the dean of 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.

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

Concurrent Credit from Another Institution

A student may not obtain transfer credit for courses taken at a non-University of California campus in a term during which the student is 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.

See the Summer Sessions bulletin for detailed information.

THE MAJOR

Declaration of Major

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

College of Engineering. Students applying to the College of Engineering must declare a major on their applications. Their freedom to change majors thereafter may be limited.

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

To be accepted into a major, you must have a C average in all courses you have completed that are a requirement for that major, as well as a C average in the upper division courses you have taken toward the major. Additional requirements, such as completion of a particular set of required courses with a specified grade-point average (usually well above a C average) may be introduced as conditions for acceptance into any major at any time.

If your performance is unsatisfactory after you have declared a major program, you may be required to withdraw from that major by the dean, upon written rec-

ommendation from the chairperson of the department or the curriculum committee that administers the major.

Change of Major Within a College

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

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

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

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

Change of Major Accompanied by Change of College

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

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

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

Multiple Majors

College of Agricultural and Environmental Science. Because of similarity in course requirements for many of the major programs in the College, requests for multiple majors are not normally approved. If you are interested in two or more areas of study, you should consider the options of planning an individually designed major, or of adopting one or more of the minor programs offered by the College to complement your major. 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.

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

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

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

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

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

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

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

1. in the following group: biochemistry, biological sciences, 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 Majors

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

for multiple majors, you should determine the total requirements needed for each major as well as for graduation from each college involved.

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

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

Individual Major

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

THE MINOR

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

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

If you want to have completion of a minor certified on your transcript, you must obtain a minor petition from your Dean's Office and file it no later than the deadline for filing for graduation. You can elect only one minor

in a subject area. Requirements for the minor must be met by the time of graduation.

No minors are available in the College of Engineering, although students in Engineering may, with the consent of their advisers, develop minors in either the College of Letters and Science or the College of Agricultural and Environmental Sciences. The Undergraduate Office in the College of Engineering has the primary responsibility for certifying minors and should be consulted before you begin the minor sequence.

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

EXAMINATIONS

Midterms

In undergraduate courses for which a midterm examination is required, each student has the right to take the midterm (or submit the take-home examination as opted by the instructor) during one of the regularly scheduled meetings of the class as published in the *Class Schedule and Room Directory*. The scheduling of a midterm examination at a time other than a regularly scheduled class meeting requires mutual consent of the instructor and each student 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.

Final Examinations

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

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

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

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

An instructor may release each student's original examination, or a copy, at any time. Otherwise the instructor will keep the exams, or copies of them, until the end of the next quarter, during which period students may pick them up.

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

The instructor determines, in consultation with the student and the campus learning disability specialist, whether an adjustment is necessary and specifies the terms of the adjustment.

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

GRADES

Every instructor is required to assign a grade for each student 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+	2.3=C+	0.0=F
4.0=A	2.0=C	0.0=I
3.7=A-	1.7=C-	0.0=P/NP
3.3=B+	1.3=D+	0.0=S/U
3.0=B	1.0=D	
2.7=B-	0.7=D-	

Grade-Point Average (GPA)

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

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

Passed/Not Passed (P/NP) Grading

Subject to regulation by the faculties of the colleges and schools, an undergraduate student in **good standing** can 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.

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

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

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

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

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

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

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

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

College of Letters and Science: Graduating seniors, and other students planning to undertake graduate or professional studies, should consult an adviser before petitioning for Passed/Not Passed in courses required for the major program.

Satisfactory/Unsatisfactory (S/U)

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

Petitions are available from the Graduate 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.

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

In-Progress (IP) Grading

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

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 quarter (excluding summer sessions) of the student's academic residence, or the grade will revert to an F (or NP or U). If a student's degree is conferred before the expiration of the time limit for an I-grade conversion, and the grade is not replaced by the end of the third quarter succeeding the quarter in which the I grade was assigned, the I grade will remain on the student's record.

You may not re-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 which option you have exercised. Therefore, it is recommended that students not delay the clearance of incomplete grades so as not to jeopardize graduation.

Changes of Grade

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

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

Repeating Courses

Undergraduates may repeat any course in which they received a D, F, or NP. Up to a maximum of 16 units, the grades for both the first and second time a course is taken will appear on the student's transcript, but only the grade earned the second time a course is taken will be calculated into the student's GPA. After the 16-unit maximum is reached, the grades for both the first and second time a course is taken will be calculated into the student's GPA. However, the units completed after the 16-unit maximum is reached are credited toward the student's degree only once.

Repeat units of English A are not counted against the 16-unit maximum. Courses in which students received

a grade of D or F may not be repeated on a P/NP basis. (Courses in which a grade of NP was received may be repeated on a P/NP basis.)

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

Graduate students may repeat any course in which they received a C, D, F, or U. Up to a maximum of 9 units, only the grade earned the second time a course is taken will appear on the student's transcript. After the 9-unit maximum is reached, the grades for *both* the first and second time a course is taken will appear on the student's transcript. However, the units completed after the 9-unit maximum is reached are credited toward the student's degree only once.

A course in which a C, D, or F grade has been earned may not be repeated on the S/U basis. (Courses in which a grade of U was received may be repeated on a S/U basis.)

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 student I.D. card to the Office of the Registrar before the end of the quarter.

Transcripts

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

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

HONORS AND PRIZES

Deans' Honors Lists

According to Davis campus regulations, the quarterly Dean's Honors List includes names of students who have completed, for a letter grade, a minimum of 12 units in a specific quarter with a grade-point average equal to or higher than the minimum grade-point average attained by the upper 16 percent of those registered in the same class-level and college during the preceding quarter. 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.

The Honors Program of the College of Letters and Science

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

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

Scholarships

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

Graduation Honors

Honors at graduation are awarded to students who have a grade-point average in the top percent of their college or school as shown in the table below.

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

Grade-point averages from the winter quarter previous to graduation are used to determine the averages that will earn an honors designation. Following are the averages for winter quarter 1991. These averages will be used through winter 1992.

Percent Determining Cut-Off Point	Grade-Point Average by College		
	Agricultural and Environmental Sciences	Engineering	Letters and Science
2%	3.883	3.827	3.834
3%	3.836	3.803	3.780
4%	3.780	3.762	3.745
6%	3.670	3.673	3.691
8%	3.630	3.582	3.644
12%	3.517	3.466	3.546
16%	3.407	3.380	3.467

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

College of Letters and Science. Graduation with honors requires that a student meet the appropriate grade-point requirement for all courses as described in the above table. Students who complete the Col-

lege Honors Program and who meet the grade-point requirement for graduation with honors may be recommended by their departments for graduation with high honors or highest honors on the basis of an evaluation of their academic achievements in the major and in the honors project in particular. Graduating students will not be awarded honors with the bachelor's degree if more than eight units of grade I (Incomplete) appear on their transcripts. The College Committee on Honors may consider exceptions to this condition. Petitions for this purpose should be submitted to the Dean's Office.

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.

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

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

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

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

Honorary Societies

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

Alpha Epsilon (Agricultural Engineering)
Alpha Kappa Delta (Sociology)
Alpha Omega Alpha (Medicine)
Alpha Zeta (College of Agricultural and Environmental Sciences)
Delta Phi Alpha (German)
Dobro Slovo (Russian)
Golden Key (All colleges and schools)
Omicron Delta Epsilon (Economics)
Omicron Nu (Applied Behavioral Sciences)



Order of the Coif (Law)
Phi Alpha Theta (History)
Phi Beta Kappa (College of Letters and Science)
Phi Kappa Phi (All colleges and schools)
Phi Sigma (Biological Sciences)
Phi Zeta (Veterinary Medicine)
Pi Alpha Xi (Environmental Horticulture)
Pi Delta Phi (French and Italian)
Pi Mu Epsilon (Mathematics)
Pi Sigma Alpha (Political Science)
Prytanean Honor Society (All colleges and schools—women only)
Psi Chi (Psychology)
Sigma Pi Sigma (Physics)
Sigma Xi (All colleges and schools—research)
Tau Beta Pi (Engineering)

WITHDRAWALS AND LEAVES OF ABSENCE

Withdrawals may be granted by the University for emergency reasons or for good cause. In order to withdraw 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 are available at the Office of the Registrar. Information on fee refunds can be found in the Fee Refund section of

this catalog. The following signatures are required on withdrawal petitions: director of the Student Health Center; adviser, lab or course instructor; Student Aid Accounting Office; Cashier's Office; and the dean of the student's college, division, or school.

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

Retroactive Withdrawals

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

Planned Educational Leave Program (PELP)

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

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

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

Students enrolled in the program are expected to devote their leave period to non-classroom activities. Students on Planned Educational Leave are not eligible to 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.

PROBATION AND DISMISSAL

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

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

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

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

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

- the student's grade-point average (GPA) is less than 1.5 for the quarter.
- the student has attempted more than 16 units graded I (Incomplete).
- the student has spent two consecutive quarters on academic probation.

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

The quantitative standards, referred to as **minimum progress requirements**, define scholarship in terms of the number of units that 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 is **less than 36**, calculated at the end of every quarter for the preceding three quarters of enrollment. Quantitative standards are not reflected on the official transcript.

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

The following courses may be counted toward unit minimum progress:

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

The dean of the student's college may grant a student a minimum progress variance of one or more quarters for an acceptable reason. 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.

SUMMER SESSIONS

Information:
44 Mrak Hall
(916) 752-1641

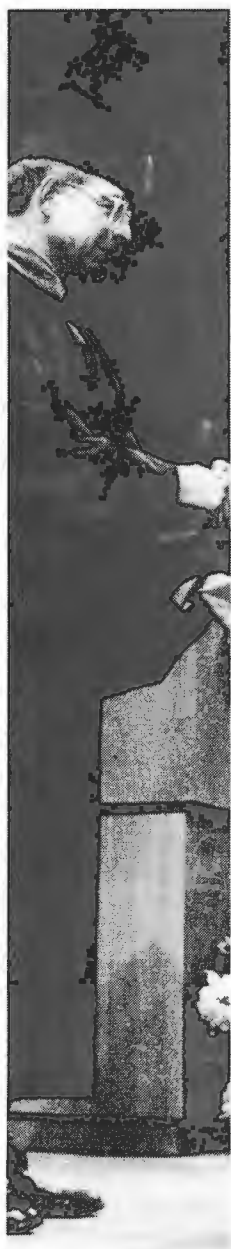
Summertime affords students the opportunity to accelerate progress toward a degree, to tackle problem courses and meet prerequisites, to take special study courses, or to do research. Although it is possible to complete up to 24 units by attending both summer sessions, 7 units per session is an average load.

Summer sessions at Davis offers a wide variety of lower division and upper division courses that provide full University credit. Special programs are also available in Great Britain, France, Japan, China, and Chile. 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 1992 there will be two six-week sessions at UC Davis: June 22 through July 31, and August 3 through September 11. For the Summer Sessions Bulletin and application materials (available about mid-March), write to the address above.



Bachelor's Degree Requirements



You become eligible for candidacy for the bachelor's degree after you satisfy four groups of requirements. They are:

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

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

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

Bachelor's Degree Requirements

University Requirements

All students must fulfill the following University of California requirements:

Subject A

American History and Institutions

Unit Requirement

Residence Requirement

Scholarship Requirement

General Education Requirement

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

College Requirements

College of Agricultural and Environmental Sciences

Unit

Residence

Scholarship

English Composition

College of Engineering

Unit

Residence

Scholarship

English Composition

Design

College of Letters and Science

Unit

Residence

Scholarship

English Composition

Area (Breadth)

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

Major Requirements

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

UNIVERSITY REQUIREMENTS

Subject A: English Requirement

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

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

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

If you have not satisfied the requirement in one of the ways described above, *you must enroll in English A during your first quarter of residence at the University, or as soon thereafter as space is available in the course.* If the requirement has not been satisfied by the end of your third quarter of enrollment, a hold will be placed on your registration. 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, 17C, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 179, 180A, 180B, 183A, 183B (upper-division courses may be taken only with the consent of the instructor)
 Native American Studies 1, 10, 55, 116, 130A, 130B, 130C
 Political Science 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163

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

- By presenting evidence that the requirement has been accepted as satisfied at another campus of the University.
- By presenting evidence that the requirement has been satisfied through courses in the area of Ameri-

can History and Institutions at another collegiate institution whose credits are acceptable for transfer to the Davis campus.

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

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

Unit Requirement

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

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

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

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

Residence Requirements

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

ter 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.

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

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

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

Scholarship Requirement

To receive a bachelor's degree, you must obtain twice as many grade points as units 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 requirements consult the college sections following.

Filing for Graduation

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

College of Agricultural and Environmental Sciences. A Major Certification form must be received and evaluated by the Dean's Office before your candidacy for a degree can be finalized. A Major Certification is completed during the quarter a student plans to graduate. At that time, the adviser and student check to see that all *major* requirements have been completed. The Dean's Office completes the degree certification by verifying that all *College* and *University* requirements have been satisfied.

GENERAL EDUCATION REQUIREMENT

The General Education Program promotes the intellectual growth of all undergraduates. The program's objectives are: (1) to offer a choice of courses in all major fields of learning; (2) to stimulate intellectual growth through the study of important methods as well as significant material in a particular discipline; (3) to involve students in the learning process by requiring

considerable writing and participation in class 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 foster knowledge of the dominant intellectual traditions, achievements, and socio-political institutions of humankind and stimulate awareness of cultural diversity within the Western tradition and in other civilizations.
2. **Contemporary Societies.** Courses in this area create an awareness of critical economic, political, and social problems of the contemporary world.
3. **Nature and Environment.** Courses in this area provide students with knowledge of major scientific ideas and discoveries and some perception of the methods, scope, power, limitations, and appeal of science.

Fulfilling the General Education Requirement

The only way that you can fulfill the GE requirement is by completing a required number of approved GE courses at UCD (see the exceptions in the paragraph below). If you have transferred from a community college or other post-secondary institution, or enter with Advanced Placement (AP) units, you still have to complete some of Davis' GE courses, but the number of required courses may be reduced depending upon the number of transfer or AP units you have brought with you.

Transfer Credit. The following courses and transfer credits will be used in determining the General Education requirement for transfer students:

- UCD Extension courses if they are accepted for transfer by the Office of Undergraduate Admissions.
- Advanced Placement credit.
- Transfer work from other community colleges and four-year institutions.

UCD Summer Sessions courses completed *before* entry do not count as "transfer credit" for determining your GE requirement. Successful completion of an approved GE course during a UCD Summer Session before entry, however, will count toward satisfaction of the GE requirement.

You should consult the "Transfer Credit Evaluation" form prepared by the Office of Undergraduate Admissions to determine your transfer credits.

You are *exempt* from the UCD General Education Requirement if

- you come from a California community college or other institution of higher education and have completed the "Transfer Core Curriculum;"

OR

- you come from another campus of the University of California and have completed the lower division breadth or General Education requirements of that campus.

Your college dean's office can tell you whether you fall into either of these categories.

Determining Your General Education Requirement

Each academic major and degree program has been assigned to one of the three areas of General Education. Each GE course has also been assigned to one of the three areas. You must complete courses in those areas of General Education *other* than the one which contains your major field.

GE courses may be either introductory or non-introductory. Introductory courses assume no prior knowledge or exposure to the field. Non-introductory courses require some background course work or familiarity with the subject. You should consult the course descriptions contained in the Programs and Courses section of this catalog for the courses recommended as preparation for non-introductory courses.

The specific General Education requirements for students entering UCD from the 1984-85 to 1986-87 academic years and from 1987-88 and thereafter are detailed in the General Education Requirements table below.

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

GENERAL EDUCATION REQUIREMENTS

(GE courses must be completed in the areas of General Education other than the area containing the major.)

Student Status	Academic Year of Entrance to UCD			
	1984-85	1985-86	1986-87	1987-88, and thereafter
Freshman or transfer student with 40 or fewer transfer units ¹	2 GE courses: <ul style="list-style-type: none"> • may be in same or different areas; • may be introductory or non-introductory 	4 GE courses: <ul style="list-style-type: none"> • maximum of 3 in one area; • maximum of 2 introductory 	6 GE courses: <ul style="list-style-type: none"> • 3 courses in each of two areas; • must have 1 introductory and 2 non-introductory courses in each area 	Same as for 1986-87
Transfer student with more than 40 but fewer than 84 units ²	No GE requirement	2 GE courses: <ul style="list-style-type: none"> • may be in the same or different areas; • may be introductory or non-introductory 	4 GE courses: <p><i>Option 1:</i> 2 courses in each of two areas:</p> <ul style="list-style-type: none"> • only 1 course in each area may be introductory <p><i>Option 2:</i> 3 courses in one area and 1 in the other:</p> <ul style="list-style-type: none"> • must have 1 introductory and 2 non-introductory in the area with 3 courses; • the single course in the other area may be introductory or non-introductory 	Same as for 1986-87
Transfer student with 84 or more units	No GE requirement	No GE requirement	2 GE courses: <ul style="list-style-type: none"> • may be in the same or different areas; • may be introductory or non-introductory 	2 or 3 GE courses: <p><i>Option 1:</i> 1 course in each of two areas:</p> <ul style="list-style-type: none"> • both courses must be non-introductory <p><i>Option 2:</i> 3 courses in one area:</p> <ul style="list-style-type: none"> • must have 1 introductory and 2 non-introductory courses

1. For the academic years 1984-85 through 1986-87, this category of GE requirements applied to freshmen or transfer students with fewer than 41 units; the unit cut-off was changed fall 1987.

2. For the academic years 1984-85 through 1986-87, this category of GE requirements applied to transfer students with 41 or more but fewer than 84 units; the unit cut-off was changed fall 1987.

Contemporary Societies (CS)

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

Nature and Environment (NE)

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

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. If your majors are classified in two or more different areas of General Education, you are required to com-

plete only the appropriate number of courses in the one area of General Education 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

A list of the courses and course sequences which have been approved for offering under the General Education Program appears on the following page. This listing is subject to change. You should check the *Class Schedule and Room Directory* each quarter for the most current information.

Restrictions Applicable to GE Courses

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

1. **Letter grading.** No GE credit will be awarded for a course that is taken on a Passed/Not Passed basis.
2. **Subject A.** This requirement must be completed before you begin your GE course work. Exception: GE credit may be earned before completing the Subject A requirement for the following course sequences which have been approved for the General Education Program: Chemistry 1A-1B, Economics 1A-1B, Psychology 15-16, and Music 3A-3B.

If you completed a GE course before fall 1986 on a Passed/Not Passed basis or before having completed Subject A, you will receive GE credit for that course.

General Education Literature Preparation List

The recommended General Education preparation listed in the course descriptions of some non-introductory courses states "any course from the GE Literature Preparation List." 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. There are two approved clusters in the area of Civilization and Culture: History 4A, 4B, 4C; and Comparative Literature 1, 2, 3.

You may earn credit for having satisfied the entire requirement in an area of General Education by completing an approved cluster which allows you to substitute introductory for any required non-introductory courses.

GENERAL EDUCATION COURSES FOR 1991-92

Note: This list contains approved GE courses for the current academic year only. Please consult prior years' catalogs or the Deans' offices for the lists of courses approved in previous years. Please note that you cannot claim GE credit for a course you completed **before** it was an approved GE course.

Civilization and Culture

Introductory

American Studies 1B
Art 1A/1AG¹, 1B/1BG¹, 1C/1CG¹, 1D/1DG¹, 25/25G¹
Classics 4A, 17A, 17B, 17C, 20
Comparative Literature 1, 2, 3, 5, 6, 7, 12, 13, 25
English 3, 4
French 25
German 48, 52
History 3, 4A, 4B, 4C, 8, 9A, 17A, 17B, 72B, 161A
Integrated Studies 2B⁴, 2D⁴, 3B⁴, 3C⁴, 8B⁴
Italian 50
Linguistics 1
Music 3A-3B², 10
Philosophy 1, 10B, 10D, 13, 14, 17, 21, 22, 23, 24, 31
Political Science 4
Religious Studies 21, 40
Russian 44

Civilization and Culture

Non-Introductory

Art 178C
Classics 140, 141, 143
Comparative Literature 8, 20, 135, 141, 153, 157, 159C,
160A, 160B, 161A, 161B, 163, 164A, 164B, 164D, 166A,
166B, 168A, 168B, 169, 170
Dramatic Art 156, 157
Education 120
English 30A, 30B, 46A, 46B, 46C, 118, 127, 156, 162, 171A,
171B, 182, 184
French 112, 113, 114
German 110, 113, 114, 115A, 116, 117A, 117B, 118A, 118B,
119, 140, 141
History 30, 72A, 138, 140, 147A, 147B, 147C, 169A, 169B,
175A, 177A, 177B, 188A
Italian 140, 142
Landscape Architecture 140
Medieval Studies 20A, 20B, 20C, 120E
Music 110A, 110B, 110C, 110D, 129
Native American Studies 130A, 130B, 156, 181A, 181B,
181C
Philosophy 101, 102, 105, 107, 108, 151
Religious Studies 141A, 141B, 141C
Rhetoric and Communication 110
Russian 130, 131, 151, 166
Spanish 149
Veterinary Medicine 170

Contemporary Societies

Introductory

American Studies 1A
Anthropology 2, 4
Economics 1A-1B²
Environmental Studies 10
Geography 2-2G¹, 5-5G¹
History 10, 72B
Integrated Studies 3A⁴, 3D⁴, 3E⁴, 8C⁴
Native American Studies 10
Political Science 1, 2
Psychology 15-16²
Religious Studies 1, 2
Sociology 2, 3

Contemporary Societies

Non-Introductory

Afro-American Studies 100, 133
Agricultural Economics 120, 141, 141M
American Studies 45, 120, 130
Anthropology 25, 101, 117, 124, 129, 130, 133, 178

Applied Behavioral Sciences 2, 151, 153, 154, 178
Chicano Studies 132
Consumer Science 100
Economics 106
Education 110, 122, 132
Engineering: Civil 160
Environmental Studies 101, 133, 161, 165, 166
Geography 124, 155, 170, 171
History 165, 188B
Human Development 15
International Agricultural Development 10
Linguistics 113
Native American Studies 130C, 180
Philosophy 117
Psychology 175, 177
Resource Sciences 10-10G¹
Rhetoric and Communication 152
Russian 132
Sociology 25
Textiles and Clothing 107
Veterinary Medicine 170
Women's Studies 50

Nature and Environment

Introductory

Anthropology 1
Astronomy 10
Avian Sciences 11
Biological Sciences 10
Botany 10
Chemistry 1A-1B², 10
Engineering 20
Engineering: Computer Science 15
Entomology 17
Food Science and Technology 2
Genetics 10
Geology 1-1G¹, 3-3G¹
Human Development 19
Integrated Studies 1A⁴, 1B⁴, 8A⁴
Nutrition 10-11³, 20
Philosophy 31
Physics 10
Plant Science 10
Pomology 10
Wildlife and Fisheries Biology 10

Nature and Environment

Non-Introductory

Agrarian Studies 2
Animal Science 1, 2
Anthropology 15, 23, 152, 153
Atmospheric Science 10
Avian Sciences 13
Botany 101
Engineering 160
Engineering: Applied Science 137
Engineering: Civil 30
Entomology 111, 119, 147, 153
Environmental Studies 30-30G¹, 116-116G¹
Fiber and Polymer Science 110
Geology 43, 113, 116-116G¹, 131, 135, 144
Landscape Architecture 155
Microbiology 20
Philosophy 108
Physics 137, 160
Plant Pathology 140
Resource Sciences 2, 3-3G¹, 131
Water Science 10, 100
Zoology 138

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

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

³Nutrition 10 and 11 must both be completed to satisfy the requirement for one GE course. These courses may be taken concurrently, if offered, or sequentially (10 then 11).

⁴GE courses in Integrated Studies are open only to students in the Integrated Studies program.

COLLEGE REQUIREMENTS

College of Agricultural and Environmental Sciences

Unit Requirements

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

- Not more than 6 units can be Physical Education 1
- Not more than 20 units can be courses numbered 92, 99, 190C, 192, 197T, 197TC, or 199
- Not more than 12 units can be courses numbered 92 and/or 192 (credit will not be given for 192s taken prior to the completion of 84 units)
- Not more than 9 units of professional courses (numbers 300-499) may be used toward the 54 upper division units

Credit in University Extension Courses. Students in residence may apply a maximum of 9 units of credit earned in some University Extension courses toward the 180-unit requirement *provided* written approval has been obtained from the dean *before* enrolling. Units of credit allowed by the dean may be less than the number of units listed for a course. No grade points are assigned for courses completed through University Extension.

Scholarship Requirement

As of fall quarter 1984, students in the College are required to attain a minimum grade-point average of 2.0 for all courses specified as depth subject matter in their major. Each candidate must complete a program

of study either as prescribed in (a) a major approved by the Committee on Majors and Courses of Instruction and printed in this catalog, or (b) an individual major approved by the Individual Major Committee.

English Composition Requirement

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

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

OR

2. by taking, before you have completed 120 units, **either** two courses emphasizing written expression **or** one course emphasizing written expression and one course emphasizing oral expression. The following UCD courses have been approved for satisfaction of this requirement:

a. one course must be selected from English 1, 3, 20, or 103 (courses with primary emphasis in writing skills); and

b. one course selected from the courses not selected above, or from English 102, 104, Comparative Literature 1, 2, 3, or Rhetoric and Communication 1 (courses emphasizing either writing or speaking skills).

General Education

You should consult your Dean's Office, faculty adviser and/or Advising Associate in advance to determine exactly how your General Education courses will apply toward your major.



Degree Requirement Changes

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, College, and major requirements in effect at the time you were enrolled at UC Davis. If you have transferred to UCD from a 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.

Study Plan Approval

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

In conjunction with a faculty adviser and/or Advising Associate, you must plan and prepare a program that specifies your goals and shows how the graduation requirements will be met. It is a regulation that a written "study plan" be filed with your individual adviser and/or Advising Associate 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 and/or Advising Associate 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 you plan to graduate. At that time, you and your adviser and/or Advising Associate check to see that all *major* requirements have been completed. The Dean's Office completes the degree certification by verifying that all *College* and *University* requirements have been satisfied.

College of Engineering

Unit Requirements

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

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

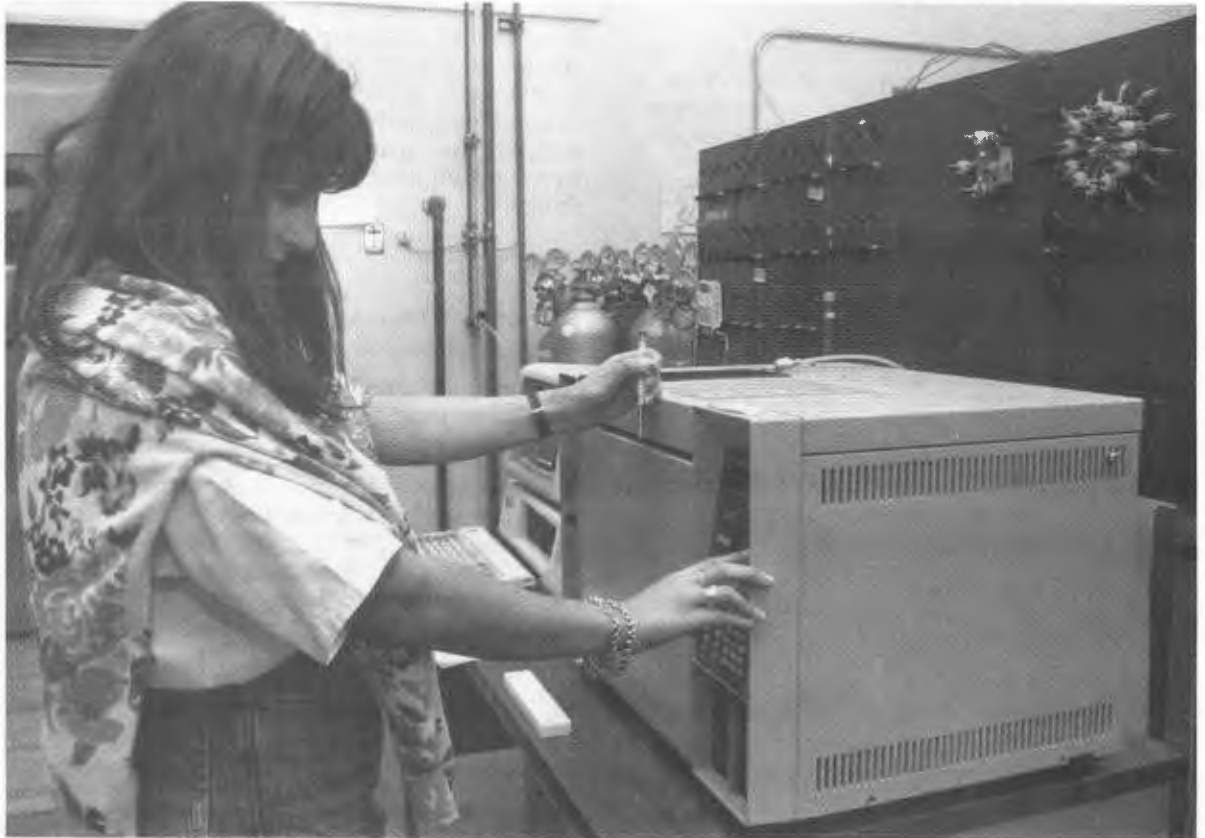
Subject Areas	Minimum Quarter Units
Mathematics (calculus, differential equations, vector analysis)	18
Physical and biological sciences (at least 10 units must be in general chemistry and at least 12 units in physics for engineering and science students).....	26
Engineering (lower-division subjects such as graphics, properties of materials, surveying, computer programming, statics, and circuit theory. Chemical Engineering majors may elect to take only 9 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 (courses 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 and fulfilled these specified subject area requirements, you need not take additional lower division courses, except those that are prerequisite to upper division courses in your curriculum.

The minimum number of required units in the Lower and Upper Division Programs varies, with the curriculum, from 180 to 212.5.

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.

Credit in 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 Associate Dean for Undergraduate Studies 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.



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 meeting the University scholarship requirement, you are required to maintain a 2.0 grade-point average for all upper division required courses in your major.

English Composition Requirement (Upper Division)

After completing 84 quarter units, you must satisfy the upper-division English Composition requirement in one of four ways:

1. by passing the English Composition Examination administered by the College of Letters and Science. (You should take it early in your junior year and must take it before your last quarter. Units of credit are not given for passing this examination.)
2. by completing an English 102 adjunct to an upper division course in the College of Engineering with a grade of C- or higher.
3. by completing 3 units of English 104 with a grade of Pass.
3. by completing English 103A with a grade of C- or higher.

This requirement is in addition to the expository writing course requirement (English 1 or 3, or Comparative Literature 1, 2, or 3 [English 1 only for students in Agricultural Engineering]) specified in the Lower Division Programs.

During the 1991/92 academic year, the English Composition Examination will be offered on the following three Saturdays: October 26, February 1, and April 25. Sign-up rosters will be posted on the College of Letters and Science's bulletin board, Mrak Hall foyer, Monday through Thursday (or until they are filled) just preceding each Saturday examination date. You must sign up, in person, by Thursday. You must obtain the English Composition Examination form, available at the UCD Bookstore, to take the exam.

Engineering Design Requirement

Engineering design is the process of devising a system, component, or process to meet certain needs. Design involves a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. You must take at least 24 quarter units of such design coursework through a combination of required and restricted elective courses. Specific comments about design are included in individual curricula descriptions. *You should also review the design content of your individual program with your adviser in the course of completing the upper division advising worksheet.*

Electives

There are four kinds of elective courses in the engineering curricula: *Humanities-Social Sciences, General Education, technical, and unrestricted.* Transfer students have an additional set of electives: *Physical and Biological Sciences electives.*

Humanities-Social Sciences electives: Because engineers are significant agents of social change, they must be sensitive to the human setting in which that change takes place. The Humanities-Social Sciences (HSS) electives are emphasized within the engineering curricula to increase your awareness of the human and societal implications of engineering practice. The humanities include subject areas such as literature, philosophy, history, and the fine arts. The social sciences include areas such as anthropology, political science, sociology, psychology, and economics.

You must take 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. Foreign language courses must stress literature, not skills, and fine arts courses must emphasize the history and appreciation of forms of expression, not development of performance or other technical skills. You may petition to have a non-literature course in a foreign language which is not your native language count as a humanities course. You may petition for HSS credit for 92, 98, 99, 192, 197, 198, and 199 courses in appropriate cases. If you repeat any of the courses which may be repeated for credit, not more than 4 units in any such courses can be counted toward your HSS requirement.

Your HSS electives should be designed to include a comprehensive and coherent set of courses and may, in some cases, be integrated with your General Education electives, as described in the next section. HSS electives must be selected from the following list.

- Afro-American Studies 10, 15, 50, 80, 100, 101, 107, 110, 120, 121, 123, 133, 145A, 145B, 150A, 150B, 151
- Agricultural Economics 1, 100A, 100B, 120, 141, 141M, 150, 169
- American Studies 1A, 1B, 1C, 1E, 1F, 2, 10, 45, 101A-H, 120, 125, 130, 151, 152, 153
- Anthropology 2, 3, 4, 25, 101, 110, 112, 114, 117 through 149, 170 through 179
- Applied Behavioral Sciences 1, 2, 17, 18, 140, 151 through 154, 157, 161 through 165, 170, 171, 172, 175 through 178, 190
- Art 1A, 1B, 1C, 1D, 10H, 10S, 15, 20, 25, 150 through 188C, 190 (also Art 1AG, 1BG, 1CG, 1DG, and 25G when taken concurrently with Art 1A, 1B, 1C, 1D, and 25)
- Asian American Studies 1, 2, 20, 100, 101, 110, 111, 112, 113, 130, 150, 155
- Chicano Studies 10, 20, 102, 132
- Chinese 10, 11, 104 through 107, 109A-I, 111 through 116, 130, 131, 132, 140
- Classics 4A, 10, 17A, 17B, 17C, 20, 140, 141, 142, 143, 174, 175
- Comparative Literature 1 through 53B, 135 through 170
- Consumer Science 100
- Design 140, 142A, 142B, 143, 144
- Dramatic Art 15 (but not 15L), 20, 70, 115, 150

- through 159
- East Asian Studies 113
- Economics 1A-1B, 100, 101, 105, 106, 110A through 136B, 151A through 175
- Education 110, 117, 118, 120, 122, 123, 130, 132, 142, 145, 151, 153
- English 3, 4, 30A, 30B, 45, 46A, 46B, 46C, 105C, 107, 110A through 189
- Environmental Studies 101, 133, 160 through 167, 169
- French 25, 45, 101, 102, 103, 107, 112 through 123, 140 through 150, 162
- Geography 2, 5, (2G, 5G when taken concurrently with 2 or 5), 6, 10, 50, 104, 120 (but not 120L), 121, 122A through 127, 141 through 162, 168, 170 through 173, 175
- German 48, 50, 51, 52, 106, 110 through 133
- History 1 through 90A, 101 through 191B, 193 through 196B
- Human Development 15, 100A through 103, 110, 130, 131, 132, 151, 160
- Integrated Studies 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 3D, 3E, 8, 8B, 8C (Open only to students accepted to the Integrated Studies Program)
- International Agricultural Development 10, 103
- Italian 25, 50, 107 through 139C, 145
- Japanese 10, 15, 25
- Landscape Architecture 140
- Linguistics 1, 100, 102, 113, 115, 120, 135, 138, 150
- Medieval Studies 20A, 20B, 20C, 120A-F
- Music 3A, 3B, 4A, 4B, 4C, 5A, 5B, 5C, 10, 24A through 28, 107A, 107B, 107C, 108A, 108B, 109, 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, 188, 190, 191
- Nutrition 20
- Philosophy 1, 10A-G, 13, 14, 17, 18, 21, 22, 23, 24, 100 through 106, 109, 114A through 123, 127, 137, 143 through 177, 190
- Physical Education 36A, 36B
- Political Science 1 through 7, 100 through 113, 115 through 187, 189-191
- Portuguese 103A-118
- Psychology 1, 16, 112, 114, 115, 120, 130, 131, 132, 135, 136 through 150, 165, 168, 171, 175, 177, 180C 183
- Religious Studies 1, 2, 4 through 75, 100 through 172, 178A-E
- Rhetoric and Communication 10, 42, 103 through 143, 152
- Russian 30, 41, 42, 44, 120 through 154, 166
- Scandinavian 110, 111
- Sociology 1, 2, 3, 25, 102, 107, 110 through 165B, 170 through 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, 100, 102

General Education electives are used to satisfy a campus requirement and are chosen from the General Education Courses for 1991-92 list earlier in this chapter. Since all engineering majors are in the Nature and Environment GE area, you must fulfill the campus requirement by taking courses in the Civilization and Culture and Contemporary Societies areas which

broadly overlap Humanities and Social Sciences, respectively.

You should note that the requirement of 24 quarter units of Humanities and Social Science (HSS) course work is a College of Engineering requirement and is in addition to the campus General Education (GE) requirement of a fixed number of courses. *You may satisfy the HSS and GE requirements simultaneously, provided that you take the courses that are listed on both the list of HSS courses above and the GE courses list shown earlier in this chapter.* In general, a good academic strategy is to satisfy the campus GE requirement first and then to satisfy any remaining HSS requirements by taking courses from the HSS list. In this way, you can benefit from the breadth and depth of course coverage inherent in the GE program structure. (For example, courses from areas outside of your major field of study are required and you must take course work at both the introductory and non-introductory levels.)

In satisfying the GE requirement, note that (a) *you must take GE courses for a letter grade* and (b) *you must fulfill the Subject A requirement before you begin your GE course work.* In consultation with your academic adviser, you should attempt to design a comprehensive and coherent set of courses using both the HSS electives and GE electives.

Technical electives permit you to tailor a program to your own academic and career objectives. For some, the technical electives offer the opportunity to prepare for a specific occupation. For others, they offer an opportunity to broaden a background in the sciences and engineering.

You may receive technical elective credit up to a maximum of 6 units for any combination of engineering courses numbered 190C, 192, 197, 198, and 199. Academic credit for 199 courses is limited to a maximum of 5 units for each substantially different project. Academic credit for engineering internship courses (192s) is limited to a maximum of 5 units per quarter.

With the exception of the following courses, all upper division courses in engineering, physics, chemistry, mathematics, and statistics may be taken as technical electives. The courses which may *not* be used are:

Applied Science Engineering 137 (restricted to one unit of technical elective)
Physics 137 (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 to chemistry, engineering, mathematics, physics and statistics courses, the following courses may be taken as technical electives:

Agricultural Economics 113, 140, 147, 148, 157, 176
Agricultural Engineering Technology 161A, 161B
Animal Science 1, 105, 133
Art 121A
Atmospheric Science 105, 121A, 121B, 124, 133, 149A
Biochemistry and Biophysics 101A, 101B
Biological Sciences 1A, 1B, 1C

Chemistry 1C, 4C, 5, 8A, 8B
Economics 11A, 11B
Environmental Biology 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
Genetics 100
Geography 106, 110
Geology 1, 1L, 17, 50, 50L, 60, 105, 116, 117A, 117B, 123, 124, 134, 150A
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

You are urged to discuss the selection of technical elective courses with your academic adviser.

Unrestricted electives. You may count any course for which University credit is allowed as an unrestricted elective in the engineering curricula.

Physical and Biological Science electives. Transfer students who have not completed the Physical and Biological Science electives requirement should choose courses from the following list of areas:

Atmospheric Science
Biological Science
Botany
Chemistry
Biochemistry
Geology
Microbiology
Physics
Physiology
Zoology

Degree Requirement Statements

As engineering is a rapidly developing profession, curricular changes are made by the faculty from year to year. In order to ensure that you benefit from these changes, the College of Engineering has established a policy that you must fulfill the degree requirements stated in the catalog for the year in which you complete degree work or in the catalog for the year immediately preceding.

Degree Check

You should use the Degree Requirement Check sheets for each of the curricula for monitoring your progress toward a degree. The Undergraduate Office will prepare only one *unofficial* degree check for you (preferably at the end of your junior year). In order to have this degree check prepared, you must submit a signed Degree Check Request. You can obtain further information concerning this service and forms for requesting it in the Engineering Undergraduate Office.

College of Letters and Science

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.

Registration Beyond the 225-unit Limit. You are normally expected to fulfill all degree requirements within the 180- to 225-unit range. Once 225 units have been completed, 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.

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.

Limitation on Credit for Graduate and Professional Courses. Undergraduates may enroll in graduate and professional courses in the 200, 300, and 400 series subject to the restrictions described in the Academic Information section in this catalog. Graduate and professional courses which have been completed will be listed on the student's transcript in the usual manner. *However, the units earned may be counted toward degree requirements only under the conditions listed below.*

Within the limitations A, B, and C given below, undergraduate students in the College may count an unlimited number of units in graduate 200 series courses and up to a combined total of 9 units in 300 and 400 series professional courses toward degree requirements. These units, however, are not counted as upper division units unless this is granted by petition to the dean.

A. The recommendations of the instructor in the course and the department chairperson—in addition to approval from the dean—must be obtained by petition in order to receive credit toward the degree for the following kinds of courses:

- all graduate courses 200-298 whether offered by a



department or program outside of or within the College of Letters and Science

- all professional courses 300-398 for teachers offered outside of the College of Letters and Science
 - all postgraduate professional courses 400-498 offered outside of the College of Letters and Science
 - all variable unit courses 300-398 and 400-498 offered within the College of Letters and Science
- B. The minimum eligibility conditions for an undergraduate student in the College to petition for degree credit for a 200, 300, or 400 series course are a UC grade-point average of 3.3 and completion of 18 upper division units basic to the subject matter of the course. These eligibility conditions may be waived, however, upon the recommendation of the course instructor and concurrence of the department chairperson if the student's preparation warrants exception.

C. Undergraduates in the College cannot receive degree credit for special study courses 299, 399, or 499.

Limitation on Credit for Units Graded P. *Excluding courses 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.

Limitation on Credit for University Extension Courses. Students may apply credit earned in University Extension courses toward the 180-unit requirement, only when written approval has been obtained from the dean *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 Residence requirements of the College. No grade points are assigned for courses completed in University Extension.

Other Unit Credit Limitations. Following are additional courses that have limits on the number of units that can be counted toward your degree.

Internship courses (numbers 92, 192): 12 units maximum including internship units taken at other institutions. (See under Nonstandard courses below.)

Nonstandard courses (92, 97T, 97TC, 99, 192, 194H, 197T, 197TC, 199 and similar courses): 30 units maximum or one-sixth of the units taken at UCD, whichever is the smaller. (Note separate unit limits on internship, special study, and tutoring courses; and major limitations.)

Physical Education 1: 6 units maximum.

Special Study courses (99, 194H, 199): 5 units maximum in any one quarter. (See under Nonstandard courses above.)

Tutoring courses (97T, 97TC, 197T, 197TC): 10 units maximum. (See under Nonstandard courses above.)

Residence Requirement

While registered in the College of Letters and Science a minimum of 27 upper division units, including 18 upper division units in the major, must be completed on the Davis campus. (Work completed while 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. Only grades earned in courses taken at UCD will be included in the grade-point computations. To obtain

these minimal averages in the major, you may, *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.

English Composition Requirement

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

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

OR

2. by completing with a grade of C- (or P) or better

a. one course in English composition from English 1, 3, 20, Comparative Literature 1, 2, or 3;

and

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

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

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

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

October 26, 1991

February 1, 1992

April 25, 1992

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 before each Saturday examination date.

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

Area (Breadth) Requirement

The College Breadth Requirement promotes the intellectual growth of students by asking them to acquire a broader background of knowledge than is provided by the usual major. The Breadth requirement also guides students in exploring the interdependence of knowledge and, in the case of the A.B. degree, provides students the opportunity to become acquainted with performance in the fine arts.

A.B. degree—satisfaction of the campus General Education requirements **plus** completion of one of the following options:

a. a "Mini Minor" consisting of a minimum of three **approved** upper division courses in a single Let-

ters and Science department or program other than the major;

OR

b. a minimum of three **approved** lower or upper division courses in art, music, or dramatic art from outside the student's major;

OR

c. a certified minor from any UC Davis college or program

The Letters and Science faculty believes that the completion of a certified minor is often the best way for a student to obtain structure and coherence in pursuit of intellectual breadth.

For the purposes of options a and b above, all courses are considered as approved except: courses bearing less than 3 units credit, internship courses, non-standard courses, directed group study courses, and courses used to satisfy the College English Composition Requirement.

Twelve units of *upper division* courses must be completed in Letters and Science teaching departments other than the major department or program. Courses numbered 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the 12-unit requirement; not more than 10 units in special study courses (194H, 199) may be counted.

B.S. degree—a total of 90 units in natural sciences/mathematics; and satisfaction of the General Education requirement.

Courses numbered 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the natural sciences/mathematics Area requirements. A maximum of 10 units in special study courses (99, 194H, 199) may be counted toward that portion of the Area requirements. Courses used to satisfy the English Composition and Foreign Language requirements may not be counted toward the area requirement. Subject to the restrictions just listed, courses acceptable for fulfilling the 90-unit natural sciences/mathematics area requirement are as follows:

Natural Sciences and Mathematics

- Anthropology 1, 5, 15, 151, 152, 153, 154A, 154B, 155, 156, 157, 158
- Astronomy
- Avian Sciences 13
- 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

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

A.B. and B.A.S. degrees—the 15-unit level or the equivalent in one language.

B.S. degree—none.

Acceptable Languages. The Foreign Language requirement may be satisfied in any language offered at UCD, or for which transfer credit is allowed from another academic institution, with the exception of American Sign Language.

You may also satisfy this requirement by examination in a language not offered on the Davis campus. In this case, the Dean's Office will assist you in making arrangements to take an examination on another University of California campus, with a faculty member who teaches the language in question.

Satisfaction of the Requirement. 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.

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

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

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

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

5. *Proficiency Examination.* If you have not completed the required level language course, but assume you have attained equivalent knowledge, you may satisfy the language requirement by passing a proficiency examination. For more information consult the appropriate foreign language department.



Major Program Requirements

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

No more than 6 units in internship courses (numbered 92, 192, or similar internship courses), may be accepted in satisfaction of the requirements of major programs. Courses numbered 97T, 97TC, 197T, and 197TC do not satisfy unit or course requirements in the major.

Change in Requirements

On occasion, the faculty makes changes in the requirements that students must satisfy to obtain the baccalaureate degree. So that you will not be penalized by changes that may work to your disadvantage and so that you will benefit by changes that assist you in completing your degree requirements, it is College policy that you may choose to fulfill the University and College requirements (see General Education requirement for an exception) as stated in any UCD *General Catalog* in effect at any time you were 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.

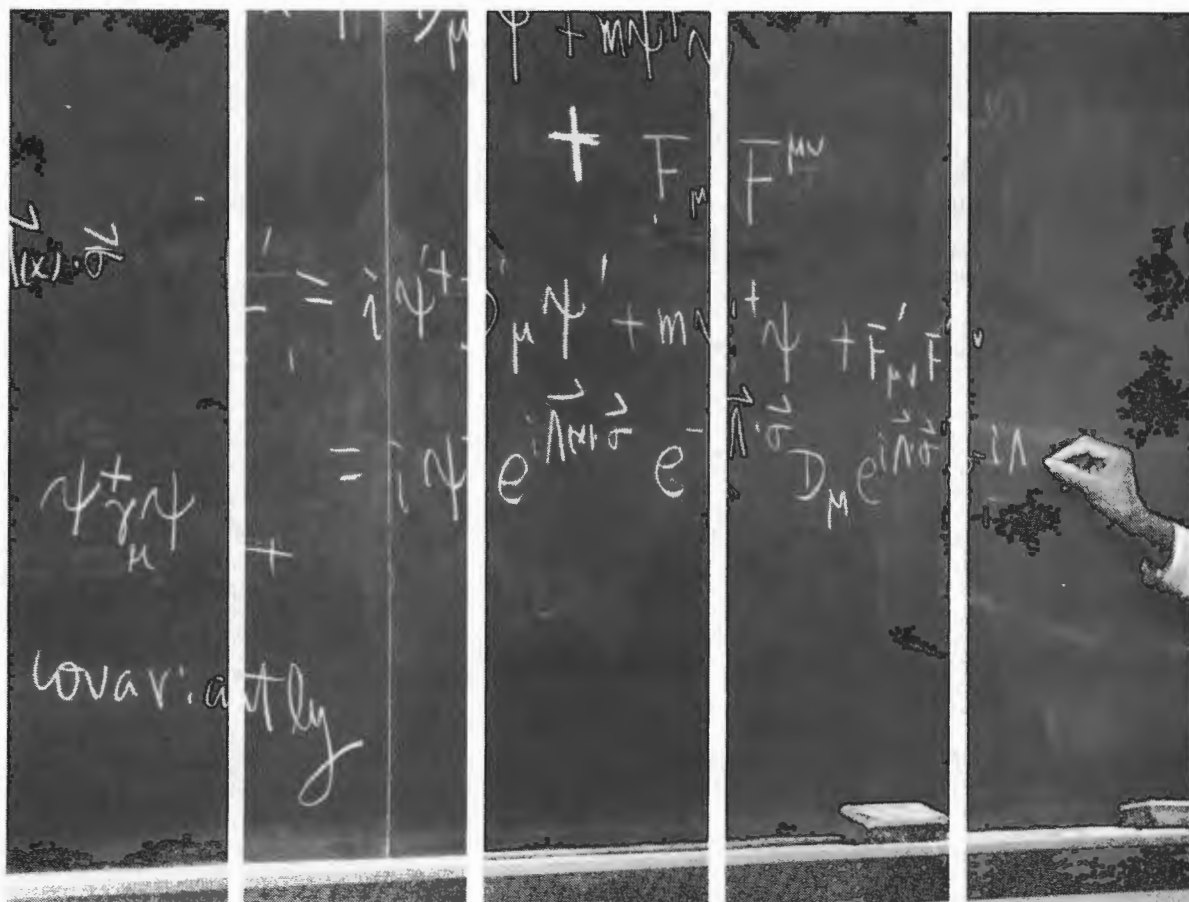
With respect to the completion of your major requirements, most of the majors in the College of Letters and Science require completion of the major degree requirements in effect at the time you officially declared your major. However, because departments differ in how these matters are handled, check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

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, informational materials are available in the Letters and Science Advising Office providing instructions on evaluating your progress on College and University requirements. You should also obtain a check of major requirements from your faculty adviser.

Once you have completed 135 units of degree credit, a hold will be placed on your registration materials requiring that you contact the Letters and Science Advising Office and your faculty adviser for a degree check.

The Graduate Division



Information:
252 Mrak Hall
916-752-0650

The Graduate Division offers advanced degrees in more than 80 graduate programs. Students' graduate study is guided by either departments or graduate groups. Graduate groups are composed of individual faculty members with similar disciplinary or research interests. The group structure, used extensively at Davis, permits faculty to be affiliated with graduate programs in more than one discipline and offers students flexibility and breadth by crossing the administrative boundaries of the various departments, colleges, schools and sometimes campuses. 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. You will find a list of the graduate degrees available at UCD in the front of this catalog

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.

PREPARING FOR AN ADVANCED DEGREE

Admission to a graduate program at the University of California requires a bachelor's degree that is compa-

rable to a degree from the University of California both in distribution of academic subject matter and in scholarship achievement.

The primary requirement for admission to any program is evidence of intellectual achievement and promise. Your application will be evaluated primarily on the basis of your transcript to assure that your qualifications meet minimum standards as set by Universitywide and UC Davis Graduate Councils. Generally, you must have a minimum B average in undergraduate course work from an institution of acceptable standing to be considered for admission. Graduate programs frequently require submission of additional materials such as a separate application form, Graduate Record Examination (GRE) scores, letters of recommendation, portfolios, or examples of written work to assist them in selecting from among qualified applicants. Admission to graduate study is limited by the number of spaces available in major programs. Not all eligible applicants can be admitted.

UCD is committed to maintaining excellence, preserving fairness, and promoting diversity in its student population. In addition to an applicant's past scholastic achievement, admissions criteria include applicants' potential for service in the field, keeping in mind the needs of our society and of underrepresented and disadvantaged communities. Criteria also attempt to take into account any prior disadvantages applicants have experienced that may bear on future achievements and services.

DEADLINES				
	FALL 1991	WINTER 1992	SPRING 1992	FALL 1992
Deadline for filing applications for admission to graduate standing, with complete credentials, with the Dean of the Graduate Division				
United States residents	June 1			June 1
International students	April 1			April 1
Deadline for filing applications for readmission to graduate status with the Graduate Division	Aug. 1	Nov. 1	Feb. 3	Aug. 3
Deadline for students who expect to complete work for master's degrees to file applications for candidacy with the Dean of the Graduate Division	Oct. 1	Jan. 10	Mar. 2	June 1 (for Sept. '92) Oct. 1 (for Dec. '92)
Deadline for candidates for master's degrees to file theses with the committee in charge	Nov. 1	Feb. 7	May 4	July 20 (for Sept. '92)
Deadline for candidates for master's degrees to file theses or final report on comprehensive examination with the Dean of the Graduate Division	Dec. 13	Mar. 26	June 19	Sept. 11 (for Sept. '92)
Deadline for students who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering to file applications for candidacy with the Dean of the Graduate Division	Aug. 15	Nov. 11	Feb. 3	May 18 (for Sept. '92) Aug. 14 (for Dec. '92)
Deadline for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the committee in charge	Oct. 1	Jan. 6	Apr. 1	July 1 (for Sept. '92)
Deadline for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the Dean of the Graduate Division	Dec. 2	Mar. 2	June 1	Sept. 1 (for Sept. '92)

APPLYING FOR ADMISSION

Applications are accepted for fall quarter only. Combined admission and fellowship application forms are available from the Graduate Division, University of California, Davis, CA 95616. You should begin the application process as early as possible in the academic year since many programs have early deadlines. In addition, your chances for employment as a teaching or research assistant or of receiving financial support are greatly enhanced by applying early. The application deadline is June 1, unless otherwise indicated by the program, or until your proposed major program is full, whichever occurs first.

The completed application form, along with the \$40 nonrefundable application fee and official transcripts from each college and university you have attended must be sent directly to 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 be forwarded to your proposed major program where they will be evaluated along with the supplemental materials you have sent to the program adviser. The Graduate Admissions Advisory Committee for the program will submit its recommendation and evaluation to the Graduate Division; final admission decisions rest with the dean of the Graduate Division. This approval procedure applies to all applicants, including those seeking a transfer to UC Davis from another UC campus.

Applications for the degrees of Juris Doctor, Doctor of Medicine, Doctor of Veterinary Medicine, Master of Business Administration, and Master of Preventive Veterinary Medicine must be filed directly with the appropriate professional school.

Readmission

If you were formerly enrolled at UCD as a graduate student and wish to return, you must apply for reentry and pay the readmission application fee of \$40 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 applicants for readmission will be considered in competition with other applicants for the program.)

International Students

Assessment of a foreign degree is based on the characteristics of the national system of education, the type of institution attended, and the level of study completed.

If you are an international student with credentials from universities outside the U.S., you should begin the application process as early as a year in advance. Official copies or certified copies of all transcripts in English and in the original language are required before your application can be processed. Completed applications along with the nonrefundable \$40 application fee must be received from international stu-

dents by April 1, unless your proposed program has an earlier deadline.

English Requirement. If English is not your native language and you have not studied at an institution where English was the language of instruction, you will be required to demonstrate proficiency in English by submitting your test scores from the Test of English as a Foreign Language (TOEFL). This test is given six times each year by the Educational Testing Service, CN6151, Princeton, NJ 08541-6151. The minimum score required for admission to graduate study at UC Davis is 550.

Visas. If you need a certificate of eligibility for a student visa issued by UC Davis, you will be required to complete a certification of finances form showing the availability of sufficient funding for your graduate program (see under International Student Services in the Academic Advising section for complete details). No financial aid of any kind (grants, loans, fellowships, scholarships, or work-study awards) is available to international students during their first year of enrollment at UC Davis.

PROGRAM OF STUDY

New students are assigned an adviser within the appropriate department or graduate group who assists them in planning a program of study. The program will depend to some degree on the student's undergraduate training and may include undergraduate courses to remove deficiencies. Each student must satisfy the degree requirements as published in the *Graduate 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.

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 12 concurrent units, or up to one half of the unit requirement if the courses were taken at another campus of the University—providing the units were not used to satisfy requirements for another degree.

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

Ph.D. Degree

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

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

There is no University unit requirement for the doctoral degree. However, individual programs have course requirements which must be completed prior to 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 the student's critical thinking ability, powers of imagination and synthesis, and broad knowledge of the field of study. Upon recommendation of the Qualifying Examination Committee, and with the approval of the Graduate Council, the examination may be repeated one time.

After successful completion of the Qualifying Examination, the student is advanced to Candidacy for the degree. At this time, a committee is appointed to direct the student's research problem and guide in the preparation of the dissertation.

Graduate students in certain Ph.D. programs may participate in a **Designated Emphasis**, a specialization which might include a new method of inquiry or an important field of application which is related to two or more existing Ph.D. programs. The Designated Emphasis is awarded in conjunction with the Ph.D. degree and is signified by a transcript designation; for example, "Ph.D. in History with a Designated Emphasis in Critical Theory." Programs approved as Designated Emphases include: Feminist Theory & Research, International Nutrition, Computational Science, and Critical Theory.

INTERCAMPUS EXCHANGE PROGRAM

A graduate student registered on any campus of the University may become an intercampus exchange student, with the approval of the graduate adviser, the chairperson of the department or group on the host campus, and the dean of the Graduate Division on both the home and the host campuses.

An intercampus exchange student has library, health service, and other student privileges on the host campus, but is considered a graduate student in residence on the home campus. The grades obtained in courses on the host campus are transferred to the home campus and entered on the student's official graduate transcript.



Application forms may be obtained at the Office of the Dean of 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.

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 Nonresident Tuition Fellowships are awarded each year to new nonresident U.S. citizens, permanent residents of the U.S., and continuing international students based on academic merit. The available fellowships are allocated to graduate programs which choose individual recipients from among their graduate students. These fellowships are for the full amount of the nonresident tuition. A minimum grade-point average of 3.25 is required for eligibility. Application forms for Nonresident Tuition Fellowships are available at the Graduate Division, and must be filed with the chairperson of your graduate program by January 15. Students receiving any funding from a government or other outside agency, whether or not the fees are paid directly to the University of California, are not eligible for a fellowship.

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

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

GRADUATE CERTIFICATE PROGRAM FOR ENGINEERS

For engineers who already have a degree, the College of Engineering offers a Graduate Certificate Program. This program consists of 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 or 16 units of specified graduate course work, or a combination of specified graduate and undergraduate course work
- Admission to the Graduate Division

Further information on the Graduate Certificate Program may be found in the *College of Engineering Bulletin*.

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 (must be completed by August 31, 1994, in addition to having completed the teaching program and applied for the credential); **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 Division of Education or the Department of Applied Behavioral Sciences.

While admission to the teacher education program is by the Graduate Division, applications and filing deadlines should be obtained from the Division of Education, 174 Kerr Hall, University of California, Davis 95616 or the Department of Applied Behavioral Sciences (home economics and agricultural education), 106 AOB 4, University of California, Davis 95616. A scholarship record of B (3.0) is required for admission to the program.

- The California Basic Educational Skills Test (CBEST) must be taken prior to acceptance by the Graduate Division.

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 Division of Education.

Students considering teaching as a career should consult the Division of Education or the Department of Applied Behavioral Sciences **as early as their freshman year**. Because of the complexity of the Teacher Preparation and Licensing Law and the requirements of Davis campus programs, students are encouraged to maintain close contact with education advisers throughout their undergraduate years.

School of Law



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

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

PREPARATION FOR THE STUDY OF LAW

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

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

Assistance in program planning may be obtained from the Pre-Law Advising Office, South Hall, 916-752-3009.

For additional information, see the *Official Guide to U.S. Law Schools—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 Services, Box 2000, Newtown, PA 18940.

APPLYING FOR ADMISSION

February 1 Deadline for filing applications for admission for 1992-93 to the School of Law

1. 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 \$40 nonrefundable appli-*

cation fee in the form of a check or money order made payable to The Regents of the University of California.

The last date for filing completed application forms, together with all supporting documents, including LSAT scores, Law School Data Assembly Service (LSDAS) reports, and letters of recommendation, is *February 1* of the year in which admission is sought. Early filing of all application materials is strongly recommended and will materially assist the School of Law Admissions Committee in its considerations. Applications postmarked after February 1 will be returned to the applicant.

2. You must take the Law School Admission Test and submit the Law School Application Matching Form with your application so that the score will be reported to the school. You are urged to take the test as early as possible, and in no event later than December preceding the year in which admission is sought.

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. The completed test application blank, accompanied by the required fee, must be postmarked at least 30 days before the date of the test to ensure the applicant's being registered.

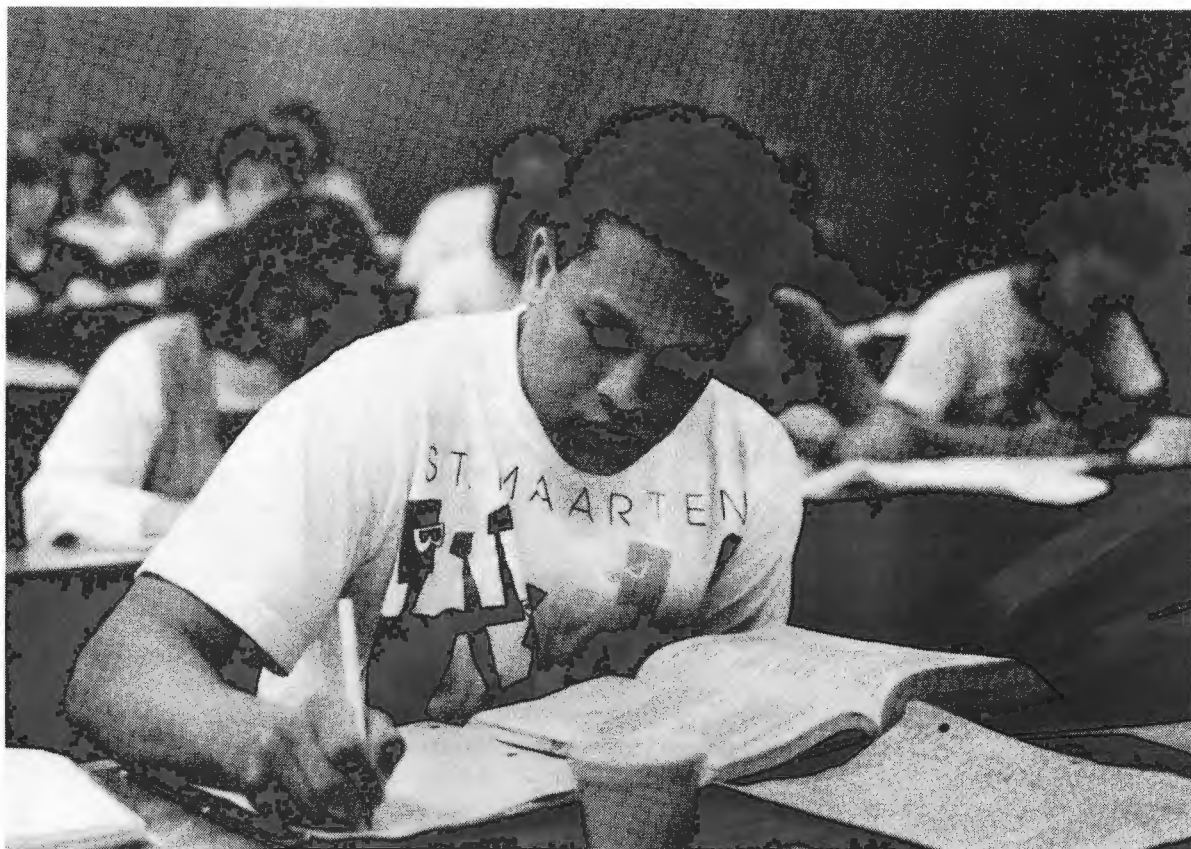
To obtain application forms, information about the test, specific test dates, and the location of testing centers, write to: Law School Admission Test, Law Services, Box 2000, Newtown, PA 18940. The information booklet is also available in the Law School Admission Office and the Prelaw Advising Office on campus.

3. You should register with the LSDAS no later than December 1 by completing and mailing the registration form supplied with each LSAT information packet. A transcript from each college or university attended must be sent directly to the Law School Data Assembly Service, Law 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 must come directly from the writer or from a college placement center, career center, or college pre-law office**. Your application cannot be considered until two letters have been received.

Your application will be reviewed by the School of Law Admissions Committee, which seeks students of demonstrated academic ability, as evidenced by LSAT scores and the undergraduate grade-point average (GPA). The committee seeks students of diverse backgrounds and considers ethnic and economic factors, advanced degrees or other advanced studies, significant work experience, and extracurricular and commu-



nity activities during and after the college years. An applicant's growth, maturity, and commitment to the study of law are also major considerations.

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

6. When accepted by the School of Law, you are simultaneously admitted to 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.

Recruitment of Underrepresented Groups

The students and faculty of the UCD School of Law recognize the great need for lawyers from underrepresented groups. The School, therefore, actively solicits applications from Asian, African-American, Hispanic, American Indian, Filipino, and other underrepresented students.

The School of Law, in cooperation with the Association of American Law Schools (AALS) and the Council on Legal Education Opportunity (CLEO), participates in programs designed to increase the number of law students from underrepresented groups. CLEO applications may be obtained by writing to: Council on Legal Education Opportunity, 818 18th Street N.W., Suite 940, Washington, D.C. 20006.

Scholarships for Indian and Alaskan natives are available from American Indian 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.

PROGRAM OF STUDY

The course of study in the professional curriculum requires six semesters for completion and extends over a period of three years. It is designed for full-time students only; no part-time or evening program is offered. New students are admitted only at the beginning of the fall semester.

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

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

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

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

Combined Degree Programs

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

Normally, a Combined Degree Program will take at least four years. You will usually be able to earn up to 10 semester-hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than it would take to earn the two degrees separately. The first year of the Combined Degree Program must be taken entirely in the School of Law. During the remaining years, 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 economics and sociology, and with the School of Management for the M.B.A. degree. The Law School will attempt to work out an additional program if you are interested in other disciplines. You may enroll in the Combined Degree Program any time 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 notify the School of Law if that application is accepted. School of Law 91

SCHOOL OF LAW CALENDAR

The School of Law operates on a semester system rather than the quarter system used on the remainder of the Davis campus.

Academic Calendar 1991-92

	FALL 1991	SPRING
1992		
First-year Introductory Program	Mon-Fri, Aug 19-23	
Law School instruction begins	Mon, Aug 26	Mon, Jan 13
Labor Day holiday	Mon, Sept 2	
Thanksgiving holiday period	Thurs-Fri, Nov 28-29	
Martin Luther King, Jr. holiday		Mon, Jan 20
President's Day holiday		Mon, Feb 17
Spring recess		Mon-Fri, Mar 23-27
Law School instruction ends	Fri, Dec 6	Fri, May 1
Reading period	Sat-Tues, Dec 7-10	Sat-Wed, May 2-6
Law School examination period	Wed-Sat, Dec 11-21	Thurs-Fri, May 7-22
Last day of semester	Sat, Dec 21	Fri, May 22
Law School Commencement		Sat, May 23

*Friday, February 21 is treated as a Monday for class schedule purposes.

School of Management



The Graduate School of Management offers a full-time, two-year program leading to the Master of Business Administration degree. The program provides both entry-level and mid-career students with an understanding of management approaches to problem solving and an awareness of the environment within which public and private management decisions are made. Successful completion requires not only a sophisticated understanding of a variety of functional skills in finance, marketing, production, program evaluation and accounting, but also an understanding of computers, information systems and the application of scientific methods to the identification and solution of management problems.

PREPARATION FOR THE STUDY OF MANAGEMENT

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

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

Accounting—introductory course which discusses basic concepts.

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

English—reading and writing skills are essential for success in the program.

Mathematics—an introductory course in calculus.

Statistics—one course in elementary statistics.

APPLYING FOR ADMISSION

April 1 Deadline for filing applications for admission for 1992-93 to the School of Management

Admission is for the fall quarter only. Application materials may be obtained from the Graduate School of Management, University of California, Davis, CA 95616 and must be completed and returned, with all supporting documents, by *April 1*. The application fee is \$40.00. Completed applications for fellowship and graduate scholarships must be filed by *January 15*.

Students interested in admission to the school are urged to request an *Announcement of the Graduate School of Management* at an early date so that all minimum academic requirements and deadlines are met.

In addition to your application, you will need to submit:

- Transcripts from all colleges or universities previously attended.

- Scores from the Graduate Management Admission Test (GMAT). Applicants must take the GMAT no later than March. In order to be considered for fellowships and scholarships, applicants must take the October test to meet the January 15 deadline. For further information and registration forms contact: Graduate Management Admission Test, Educational Testing Service, CN 6108, Princeton, NJ 08541-6108, 609-771-7330.

- Three letters of recommendation. Applicants currently enrolled in school should include one recommendation from a professor. For individuals who are out of school, recommendations from employers or business associates are acceptable.

- A 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.

International Students

Foreign students for whom English is a second language must take the Test of English as a Foreign Language (TOEFL) by March 1, and receive a score of 600 or better. Registration forms may be obtained by writing to: TOEFL, Educational Testing Service, Box 899, Princeton, NJ, 08541-6108.

Criteria for Admission

The major criterion of the committee granting admission is what an applicant has to gain from, and offer to, the program. Consideration of an applicant's undergraduate performance includes a review of trends in scholastic performance and areas of academic strength as well as an assessment of overall grade-point averages. Admissions standards and grading policies of the schools attended are also considered. Both verbal and quantitative scores on the GMAT are used to evaluate measurable general aptitude for management. Background and maturity as indicated by employment history, service and activity records, recommendations, and the applicant's personal statement are factors in the committee's evaluation. Professional management experience is not required for admission but is favorably considered.

PROGRAM OF STUDY

In the first year, the program offers a series of core courses that focus on all the basic disciplines of business—accounting, economics, finance, marketing, organizational behavior, decision sciences, and information systems.

The second year of the program allows students to take courses in individually selected concentrations. These concentrations include accounting, agricultural management, environmental and natural resource management, finance, management information systems, management science, marketing, public sector management, and science and engineering management. Students may also design their own concentration.

School of Medicine



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.

PREPARATION FOR THE STUDY OF MEDICINE

When you apply to the School of Medicine, you must submit the results from the New Medical College Admission Test (MCAT), so it is recommended that you take the MCAT by the spring prior to application. Information can be obtained at your undergraduate institution or directly from MCAT Registration, Box 414, Iowa City, Iowa 53343. To be acceptable for the entering class of fall 1992, the new MCAT must be taken no later than fall 1991. No scores previous to 1991 will be accepted.

Applicants must also meet the following academic requirements:

- A. Must have completed at least three years of study in an accredited college or university in the United States or Canada. A minimum of 90 semester hours or 135 quarter units of college-level work is required. Courses in highly specialized fields are acceptable only at the discretion of the medical school.
- B. Must have completed satisfactorily before matriculation each of the following courses:

	Quarter Units	Semester Units
1. English, 1 year or its equivalent.	12	6
2. Biological science, 1 year including laboratory, or its equivalent.	12	8
3. General chemistry, 1 year including laboratory, or its equivalent.	12	8
4. Organic chemistry, 1 year or its equivalent. If two or more undergraduate organic chemistry courses are offered, it is recommended that you elect the more rigorous option.	12	8
5. Physics, 1 year or its equivalent.	12	8
6. Mathematics, course work sufficient to satisfy prerequisites for integral calculus. (Course work through integral calculus is recommended).	6	4

(You will find helpful experience and knowledge gained in biochemistry, genetics, and embryology.)

- C. Must demonstrate the potential to perform academically at least as well as the average of the current first year class. This reflects the School of Medicine's generally higher standards and our emphasis on potential as judged from the application as a whole, including but not limited to MCAT and GPA scores.

APPLYING FOR ADMISSION

November 1 Deadline for filing applications for admission for 1992-93 to the School of Medicine

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application request cards are available from the Admissions Office, School of Medicine, University of California, Davis, CA 95616 after April 1 of each year. You may also secure this form from other AMCAS-participating medical schools or from your premedical adviser. You need to submit only one application and one set of official transcripts to AMCAS, regardless of the number of member schools to which you are applying.

Upon receipt of the application request form, AMCAS will send you an application for admission, together with descriptive material and instructions. 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 a secondary application, two letters of recommendation along with a non-refundable application fee of \$40. 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. Interviews take place at the medical school in order to provide you with first-hand knowledge of programs and facilities and give you the opportunity to meet some of the students.

As decisions are made, letters of acceptance are sent; this can be as early as mid-October and as late as September of the following year.



Applicant Selection. The class entering in the fall will be limited to 93 students selected on the basis of academic achievement, academic promise, and personal characteristics. The Admissions Committee uses these criteria to determine if a candidate will be able to complete satisfactorily the requirements of the medical curriculum and become excellent medical practitioners. Factors taken into consideration include scholastic records, Medical College Admission Test performance, and reports of teachers, advisers, and interviewers with regard to intellectual capacity, motivation, emotional stability, and personal dedication.

The majority of openings in the entering class will be awarded to students who are California residents. However, the School of Medicine participates in the program of the Western Interstate Commission for Higher Education (WICHE) and residents of participating states will be considered as residents for purposes of admission. For more information, write the WICHE at Post Office Drawer P, Boulder, CO 80302.

The School of Medicine selects students for admission with a view to meeting the needs of society, of the medical profession, and of the School. Because we live in a pluralistic society, and the educational experience is enhanced by the interaction of students from various backgrounds, the School desires diversity in its student body. This is reflected in the School's commitment to expand opportunities in medical education for individuals from groups underrepresented in medicine as the result of societal discrimination and to increase the number of physicians practicing in underserved areas. Therefore, the Admissions Committee, which is composed of individuals from a vari-

ety of cultural backgrounds and which is representative of a broad spectrum of medical sciences, evaluates applicants in terms of all relevant factors. These include academic credentials, with due regard to how they may have been affected by disadvantages experienced by the applicant, such personal traits as character and motivation, experience in the health sciences and/or the community, career objectives, and the ability of the individual to make a positive contribution to society, the profession, and the School.

Transfer with Advanced Standing

Currently enrolled students in good standing at approved medical schools in the United States or Canada may apply for admission to the third year of study. In order to provide the best facilities and clinical resources, however, we must limit the number of students in our clinical clerkships. Therefore, applications for transfer to the third year are considered on a space-available basis.

Deadline for application is April 1 of the year of transfer. A nonrefundable application fee of \$40.00 is required. Applicants must provide medical school transcripts, and if accepted, must pass Part I of the National Board Examination at their current institution. Available spaces may be filled by the Admissions Committee based upon the entire content of an application, or they may request additional information including letters of recommendation and a personal interview. All applicants for transfer must meet the usual requirements for admission, as well as satisfactorily completing the equivalent of two years of study at the medical school. Applicants will be notified of the Admissions Committee's decision starting April 30.

PROGRAM OF STUDY

The curriculum for the M.D. degree is normally a four-year program that provides comprehensive training for the practice of medicine. The curriculum has been designed to provide a blend of basic sciences training and clinical experience. Although the emphasis during the first two years is on the basic-science foundations of medicine, medical students are introduced to patient care during their very first quarter of study, reflecting the school's commitment to the training of highly skilled clinicians. Several volunteer clinics, largely staffed by UCD medical students, provide an ideal setting for hands-on clinical experience.

In addition to the Doctor of Medicine degree, the School of Medicine at the University of California, Davis offers a combined M.D./Ph.D. program whose target is to train physicians to meet, respond to, and solve the broad diversity of problems and dilemmas facing current and future health care. Meeting this challenge requires those capable of advancing our biological sciences knowledge base, and others who can recognize and solve the ethical, political and humanitarian issues that confront the broad delivery of health care to all. Hence, the field for the Ph.D. in the joint degree program at UC Davis can be any graduate program offered on the Davis campus, extending beyond the traditional biological sciences boundaries, and strongly encouraging candidates to seek degrees in social sciences and humanities. All requirements for both degrees are met in a course of study that usually lasts six years. To be admitted, and be concurrently enrolled in both degree programs, students are required to apply for separate admission to both the M.D. and Ph.D. programs, and also obtain permission of the School of Medicine M.D./Ph.D. Advisory Committee. Inquiries about admission to graduate education should be directed to the Dean of the Graduate Division, University of California, Davis, CA 95616.

SCHOOL OF MEDICINE CALENDAR

The School of Medicine operates on a different schedule from the rest of the campus. A more detailed academic calendar may be obtained from the Office of Curricular Support, 2427 Medical Sciences 1A, University of California, Davis 95616.

SUMMER QUARTER 1991

Instruction begins for 3rd- and 4th-year students	Mon, July 1
Instruction begins for 2nd-year students (electives)	Mon, July 1
Instruction begins for 2nd-year (regular curriculum)	Mon, July 29
Instruction ends for 2nd-year students	Mon, Sept 9
Final exams for 2nd-year students	Sept 11-13
Instruction ends for 3rd- and 4th-year students	Fri, Sept 20
Academic and administrative holidays	Thurs, July 4 Mon, Sept 2

FALL QUARTER 1991

Instruction begins for 3rd- and 4th-year students	Mon, Sept 23
Instruction begins for 1st- and 2nd-year students	Thurs, Sept 26
Exam and study period for 1st-year students	Nov 4-8
Exam and study period for 2nd-year students	Oct 31-Nov 6
Instruction ends for 1st- and 2nd-year students	Fri, Dec 6
Final exams for 1st- and 2nd-year students	Dec 9-13
Instruction ends for 3rd- and 4th-year students	Fri, Dec 13
Academic and administrative holidays	Nov 28-29 Dec 24-25 Dec 31-Jan 1

WINTER QUARTER 1992

Instruction begins for 2nd-year students	Thurs, Jan 2
Instruction begins for 1st-, 3rd-, and 4th-year students	Mon, Jan 6
Exam and study period for 2nd-year students	Feb 6-12
Exam and study period for 1st-year students	Feb 10-14
Instruction ends for 2nd-year students	Wed, Mar 11
Final exams for 2nd-year students	Mar 13-18
Instruction ends for 1st-year students	Fri, Mar 13
Final exams for 1st-year students	Mar 16-20
Instruction ends for 3rd- and 4th-year students	Fri, Mar 27
Academic and administrative holidays	Mon, Jan 20 Mon, Feb 17

SPRING QUARTER 1992

Instruction begins for 3rd- to 4th-year students	Tues, Mar 31
Instruction begins for 2nd-year students	Mon, Mar 23
Instruction begins for 1st-year students	Mon, Mar 31
Exam and study period for 2nd-year students	April 20-22
Exam and study period for 1st-year students	April 27 - May 1
Instruction ends for 2nd-year students	Wed, May 20
Final exams for 2nd-year students	May 22-27
Instruction ends for 4th-year students	Thurs, June 11
Instruction ends for 1st-year students	Fri, June 5
Final exams for 1st-year students	June 8-12
Instruction ends for 3rd-year students	Fri, June 19
Academic and administrative holidays	Mon, Mar 30 Mon, May 25

School of Veterinary Medicine



The mission of the School of Veterinary Medicine is to provide the best possible health care for animals through teaching, research, and public service. Students are offered a rigorous four-year program of study which prepares them for diverse career opportunities in veterinary medicine.

PREPARATION FOR THE STUDY OF VETERINARY MEDICINE

To be considered for admission to the school, you must have completed 108 quarter units (72 semester units) in an accredited college or university and have completed the following courses:

Lower Division Required Sciences

	Quarter Units
General Chemistry	15
Organic Chemistry	6
Physics	6
Biological Sciences	10

Upper Division Required Sciences

Embryology	4
Genetics	4
Required English	12
Required Humanities and Social Sciences	12
Required Statistics	4

(To convert semester units to quarter units, multiply by $\frac{2}{3}$. For example, a 4 unit semester course is equivalent to a 6 unit course in the quarter system.)

You should plan your preveterinary medical education carefully. The required courses should be spaced to permit maximum scholastic achievement. An undergraduate major should be selected on the basis of individual interest and aptitude; there is no advantage gained toward admission by selecting one major over another. Many students planning to enter veterinary school have definite areas of interest within the general field of veterinary medicine. These individuals are encouraged to take courses (for example, computer science, agricultural economics, molecular and biochemical genetics) 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.

Examinations. All applicants must take the General Aptitude Test and the Subject Test in Biology of the Graduate Record Examination (GRE) by the October test date. GRADUATE RECORD EXAMINATION SCORES RECEIVED FROM THE NOVEMBER TEST OR LATER TESTS FOR THE YEAR THE APPLICATION IS FILED WILL NOT BE ACCEPTED FOR CONSIDERATION. Applications for the exams and additional information may be obtained from the Educational Testing Service, Box 23470, Oakland, CA 94623-0470. The GRE must be taken within five years of the time you submit your application. The highest scores will be used when the GRE is taken more than once.

Grade Point Average. To be considered for admission, you must have a minimum grade point average of 2.50 for both the required sciences and the accumulative. Applicants who do not meet the minimum grade point average can qualify for admission by receiving GRE scores in the upper 30th percentile for the General Aptitude and upper 30th percentile for the Subject Test in Biology. Applicants who do not have transcripts with letter grading can qualify for consideration with these same scores or by receiving a bachelor's degree with honors.

Practical Experience. Admission to the school requires extensive experience with animals. This experience should entail more than having family pets and should include experience with several animal species if it includes relevant experience with types of activities that give an applicant an appreciation and understanding of the veterinary profession. The minimum requirement for animal, veterinary and biomedical science experience is 180 hours (4.5 weeks). This experience should also include working with veterinarians, so that the applicant understands the duties and responsibilities of a practitioner and the breadth of veterinary medicine.

APPLYING FOR ADMISSION

November 1 Deadline for filing applications for admission for 1991-92 to the School of Veterinary Medicine

Students are admitted to the School of Veterinary Medicine in the fall only. Applications may be obtained any time after July 1 by writing to the Office of the Associate Dean—Student Services, School of Veterinary Medicine, University of California, Davis, CA 95616-8731 or by calling 916-752-1383. Applications, accompanied by a nonrefundable application fee of \$40 must be received by this office no later than *November 1*.

Students interested in admission to the School of Veterinary Medicine are urged to request an *Announcement of the School of Veterinary Medicine* at an early date so that all minimum academic requirements and deadlines are met.

Applicants with disadvantaged backgrounds (cultural, economic, social, educational, disabled, and other factors) are encouraged to apply to the Veterinary Medical Opportunity Program (VMOP). For further information and advising services, contact the Director of Student Affirmative Action by writing to the Office of the Associate Dean—Student Services or by calling 916-752-1806.

Letters of Evaluation. Three letters of evaluation are required in addition to your application and should be requested from persons who know you well, understand academic and professional demands, and have had the opportunity to evaluate your personal qualities and potential as a professional person. The evaluator should be willing to write a thorough, comprehensive letter on your behalf.

Interviews. Interviews may be requested, as deemed necessary, by the Dean and Admission Committee to obtain additional information. The Dean and Admission Committee may require additional evaluation procedures for selecting candidates for admission.

Out-of-State and Foreign Applicants. California residents are given priority for admission to the school. A small number of uniquely qualified applicants who are not California residents may be admitted as nonresidents. Residents of states participating in the Western Interstate Commission for Higher Education (WICHE) will be considered as residents for purposes of admission. Based on agreements with WICHE, a small number of applicants from WICHE states may be admitted with WICHE financial support. Other applicants from WICHE states may be admitted but only as nonresidents. For information related to the WICHE program, write to the Western Interstate Commission for Higher Education, Post Office Drawer P, Boulder, CO 80302. The criteria for determining residency are explained in the Statement of Legal Residence in the Appendix of this catalog. 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.

If you attended college out-of-state, you must include courses descriptions of all required science courses with your application. You can do this by sending the current college catalog or by copying the relevant pages.

If you are from a country other than the United States, you must include a certified English version of your college transcript, and, if English is your second language, the official scores from the Test of English as a Foreign Language (TOEFL) taken within five years of the date when your application is submitted.

Criteria for Selection

I. Academic Factors (50-60%)

A. College course work:

1. GPA of all undergraduate and graduate course work
2. GPA of required science course work
3. GPA of last two years of undergraduate work (minimum of 72 quarter units)

B. Graduate Record Examination:

1. General Aptitude test (Verbal, Quantitative and Analytical)
2. Subject Test in Biology

II. Non-Academic Factors (40-50%)

A. Narrative (5-20%)

B. Letters of Evaluation (5-20%)

C. Interviews (0-20%)

Applicants will also be evaluated for their understanding of the profession and the responsibilities of being a veterinarian, interest in serving the public, maturity, motivation, and other qualities necessary for successful academic and professional work.

PROGRAM OF STUDY

Doctor of Veterinary Medicine. To receive a Doctor of Veterinary Medicine degree, students must study veterinary medicine for the equivalent of 12 quarters

of 12 weeks each (the last six quarters must have been spent in the School of Veterinary Medicine, University of California, Davis). A grade-point average of 2.0 (C), computed on all courses taken in the School is required and students must satisfactorily complete all required work as determined by the faculty of the School.

Master of Preventive Veterinary Medicine. Applicants for candidacy to the Master of Preventive Veterinary Medicine (MPVM) degree program must have completed the Doctorate in Veterinary Medicine or the equivalent; final admission decisions rest with the Admissions Committee, MPVM program. For advising purposes an option should be selected from the four listed below at the time of application. Completed application materials must be submitted no later than *ninety days prior to the quarter of planned enrollment*. Application forms can be requested from the Director, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Candidates for the MPVM degree must satisfactorily complete a total of 50 units of course work while in residence. This includes 24 units of required courses and 26 units of approved electives which include 8-10 units of research in a field appropriate to the chosen option. One requirement of the MPVM program is to complete a research study which culminates in a written report and oral presentation. A committee, consisting of three faculty members, reviews each paper for acceptability and assigns an appropriate grade.

The degree program extends over a minimum of twelve months to a maximum of two years. Students who intend to complete the program in one calendar year must enroll in August unless they have recently completed and performed satisfactorily in a statistics course that has been approved by the MPVM Director 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: T. B. Farver, I. A. Gardner, D. W. Hird

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

Adviser: C. Genigeorgis

3. *Laboratory Science:* design and execution of a laboratory or a laboratory/field-based project relevant to animal health

Adviser: K. M. Lam

4. *Veterinary Programs Administration:* administration of programs for control of animal diseases, veterinary laboratories, research, or educational veterinary service (As the intent of this option is to permit



veterinarians to spend a mid-career sabbatic leave for leadership training, enrollment is limited to individuals with demonstrated record of success in some area of veterinary medicine)

Adviser: R. H. McCapes

Inquiries regarding the program should be directed to the Director, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Combined Program. Students may enroll in the combined DVM/MPVM program in which the MPVM degree may be awarded by the end of the fall quarter of the fifth year or as soon thereafter as all requirements for both the DVM and MPVM degrees are completed. The advantage of the combined program resides in the ability of the student to complete the MPVM program within six months after normal completion time of the DVM degree, rather than 15 months, as would be the case if taken sequentially.

Master of Science and Doctor of Philosophy. General information regarding these degrees will be found in the *Announcement of the Graduate Division*, which may be obtained from the Graduate Division, University of California, Davis, CA 95616. Additional detailed information may be obtained by writing the chairperson of the department in which you wish to study.

SCHOOL OF VETERINARY MEDICINE CALENDAR 1991-92

FALL QUARTER

Orientation for 1st-year students	Thur-Fri, Sept 5-6
Instruction begins for 4th-year students	Mon, Sept 9
Instruction begins for 1st- and 2nd-year students	Tues, Sept 10
Instruction begins for 3rd-year students	Mon, Sept 23
Schalm Lecture	Mon, Sept 23
Thanksgiving Holiday	Thur-Fri, Nov 28-29
Instruction ends	Fri, Dec 6
Finals end	Sat, Dec 14

WINTER QUARTER

Instruction begins	Mon, Jan 6
M. L. King Holiday	Mon, Jan 20
President's Holiday	Mon, Feb 17
Research Day	TBA
Instruction ends	Tues, Mar 17
Finals end	Thur, Mar 26

SPRING QUARTER

Instruction begins	Mon, April 6
Memorial Day Holiday	Mon, May 25
Instruction ends for 3rd-year students	Fri, June 5
Instruction ends for 1st- and 2nd-year students	Fri, June 12
Finals end for 3rd-year students	Fri, June 12
Finals end for 1st- and 2nd-year students	Fri, June 19
Commencement	Sat, June 13

Programs and Courses



COURSE DESIGNATIONS

Here is a sample of how a course is listed in this catalog.

190 Proseminar in International Agricultural Development (1) I, II, III. The Staff Seminar—1 hour. Presentation and discussion of current topics in international agricultural development by visiting lecturers, staff, and students. May be repeated for credit. (P/NP grading only.)

Top line: course number; title; units; quarters offered; instructor(s).

Paragraph following: course setup; prerequisite; 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) or Fall Semester (August to December), School of Law
- II. Winter Quarter (January to March) or Spring Semester (January to May), School of Law
- III. Spring Quarter (April to June)
- IV. Summer Quarter (July to September) for students in the School of Medicine only

Alternate Year Designation

Some course descriptions will include the phrase "Offered in alternate years." If the course number is marked with an asterisk (*), this indicates that the course *will not* be offered this year, but will be offered the following year. If the course number is not marked with an asterisk, this indicates that the course *will* be offered this year, but will not be offered the following year.

Multi-Quarter Courses

A series of course numbers followed by two or three letters (for example, Animal Science 49A-49B-49C) is continued through three successive quarters, ordinarily from September to June. The first quarter course listed this way is a prerequisite to the second, and the second to the third. On the other hand, where A and B portions of a course are listed separately (for example, Economics 160A and 160B), the A course is *not* a prerequisite to B, unless it is specifically mentioned in the list of prerequisites.

California Articulation Number (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) 752-6302.

Expanded Course Descriptions

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

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

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



Afro-American Studies

(College of Letters and Science)

John Stewart, Ph.D., Director
Program Office, 467 Kerr Hall (916-752-1548)

Committee in Charge

Cynthia Brantley, Ph.D. (*History*)
Richard T. Curley, Ph.D. (*Anthropology*)
Carl C. Jorgensen, Ph.D. (*Sociology*)
Clarence Major, Ph.D. (*English*)
Patricia Turner, Ph.D. (*Afro-American Studies*)
Clarence E. Walker, Ph.D. (*History*)
David Scofield Wilson, Ph.D. (*American Studies*)
Chairperson

Faculty

John Stewart, Ph.D., Professor
Patricia Turner, Ph.D., Assistant Professor

The Major Program

The Afro-American Studies Program exposes students to the ideas, lifestyles, history, and political behavior of African-Americans. Though the courses offered by the program are concerned with African-America, affiliated courses in other departments allow students to study other African experiences throughout the diaspora.

The Program. There are two main areas of emphasis within the Afro-American major. The emphasis in "Culture of the Afro-American" stresses the black experience within the United States and might include everything from the study of jazz to social movements such as "Back to Africa." The emphasis in "Africa" focuses on the African experience, and might include a particular study of a tribal grouping, or of one African country or political movement. In addition, students may choose to do special research projects.

Career Alternatives. Afro-American studies majors are well prepared for employment opportunities in the Office of Education, human service units, county social service programs, and counseling services. Afro-American studies is also an appropriate background for work in community organizations like the Urban League, NAACP, Urban Affairs, and Office of Economic Opportunity. The major also provides a strong background for future study in graduate school.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	36
Afro-American Studies 10	4
Two courses from Anthropology 2; Economics 1A, 1B; Geography 2; Sociology 1; Political Science 1, 2; Psychology 1...8	
Two courses from Chicano Studies 10; Native American Studies 1, 10; American Studies 45; Asian American Studies 1, 2	8
History 27A, 27B	4
Music 28	4
One course from Statistics 13, Sociology 46A, or Psychology 41	4
Depth Subject Matter	36
A coordinated program of upper division courses, selected and approved in consultation with the major advisers to include:	
Core courses: Afro-American Studies 101, 110, 120	12
Additional upper division units chosen to reflect the student's major emphasis	24
Total Units for the Major	72

Major Program Emphasis

The following areas of emphasis are offered as a

guideline for students interested in majoring in Afro-American Studies

Culture of Afro-Americans emphasis:

Afro-American Studies 107, 120, 121;
Anthropology 140A, 140B; History
177A, 177B; Political Science 167.

African emphasis:

Afro-American Studies 107, 120, 121;
Anthropology 140A, 140B; History
115A, 116; Political Science 134, 146.

The above areas of emphasis are not the only areas students may choose for the Afro-American Studies major. However, it should be noted that the major program must (a) be developed in consultation with an Afro-American Studies faculty member, and (b) be approved by the Program's Major adviser. Information regarding the areas of emphasis may be obtained from the Afro-American Studies Office.

Related Upper Division Courses

Student who contemplate majoring in Afro-American Studies are advised that the following courses are offered by faculty members in other disciplines and focus on African and Afro-American people and their culture.

Anthropology 104, 139A, 139B, 140, 153; Applied Behavioral Sciences 151, 152, 153, 159A, 159B, 172; Art 150; Dramatic Art 155; Education 150; English 179, 181; Geology 125A, 125B.; History 102, 115A, 115B, 115C, 116, 177; Music 113B; Political Science 134, 138, 146, 151, 167, 176; Psychology 159; Sociology 129, 130.

Major Adviser. Patricia Turner.

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. Turner

Lecture—4 hours. Introduction to the contemporary Black American experience by critically examining historical, political and social and economic factors that have affected the development and status of Afro-American people.

15. Introduction to Afro-American Humanities (4) II. Major

Lecture—4 hours. Introduction to Afro-American cultural tradition as it evolved from West Africa to the Caribbean, South America and North America via slavery.

50. Black Images in Popular Culture (4) III. Turner
Lecture—2 hours; discussion—2 hours. A survey of the depictions of Blacks in popular culture (popular press, stage, radio, film, television, advertising) from the middle of the sixteenth century to the present.

51. History of Afro-American Dance (4) I. Wynn-Bolden

Lecture—2 hours; discussion—2 hours. Evolution of African-American dance, tracing its history and development from West Africa through the Caribbean and to the United States. Investigates the social relevance of African-American dance and the artistic merits and contributions of African-American choreographers and performers.

80. Introduction to Black Politics (4) I. The Staff

Lecture—4 hours. Introduction to the analysis of Afro-American politics, using conceptual frameworks

from political science and other social sciences.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Survey of Ethnicity in the U.S. (4) II. Turner
Lecture—4 hours. The history, culture, philosophy, and current problems of groups considered ethnic minorities in the United States as viewed by the groups themselves. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2 or Sociology 2.

101. Introduction to Research in the Afro-American Community (4) III.

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) II. The Staff

Lecture—4 hours. Prerequisite: course 101 or consent of instructor. Ecology, population, social organization, and survival culture of West Africa in the pre-colonial, colonial, and post-colonial periods.

*120. Afro-America: Pre-Emancipation (4) II. The Staff

Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Ecology, social organization, and survival culture of Afro-America. Historical and comparative study of Afro-American populations in relation to other groups.

121. Afro-America: Post-Emancipation (4) II. The Staff

Lecture—4 hours. Prerequisite: course 10 or 120, or consent of instructor. Analysis of contemporary Afro-American cultural adaptations and social organizations within the United States.

*123. The Black Female Experience in Contemporary Society (4) III. The Staff

Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Black female social, intellectual, and psychological development. Black women's contributions in history, literature, and social science; life experiences of Black women and philosophical underpinnings of the feminist movement.

*133. The Black Family in America (4) III. The Staff

Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Analysis of social science research to examine relationship between Black family structures, patterns of functioning, and political, economic, and social conditions. Examination of role differentiation within families by race and social class. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2.

145A. Black Social and Political Thought (4) III. The Staff

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. The Staff

Lecture—4 hours. Prerequisite: course 10, 80, 145A, or consent of instructor. Exposition and critical analysis of selected theoretical writings of Black intellectuals, and especially political and social thinkers, in the Americas.

*150A. The Afro-American Visual Arts Tradition: A Historical and Cultural Study (4) I. The Staff

Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from 1600 through Reconstruction.

*150B. The Afro-American Visual Arts Tradition: A Historical and Cultural Study (4) II. The Staff

*Course not offered this academic year.

Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from Reconstruction to present.

151. Afro-American Vernacular Music and Verbal Arts (4) III. The Staff

Lecture—2 hours; discussion—2 hours. Socio-political dimensions of Afro-American musical forms like spiritual, work song, minstrelsy blues, rhythm and blues, jazz, gospel, soul and contemporary pop, and related verbal arts like preaching, toasting, rapping, etc.

197T. Tutoring in Afro-American Studies (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-5 hours. Prerequisite: consent of major committee; upper division standing with major in Afro-American Studies. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Agrarian Studies

(College of Agricultural and Environmental Sciences)

The Major Program

The agrarian studies major provides a broad view of agriculture and its relationship to humanity.

The Program. The agrarian studies major requires courses from several academic areas. Courses in the social sciences and humanities are chosen to develop an understanding of agriculture in the context of humanity: anthropology, geography, philosophy, and economics. Courses in the natural sciences are selected to give students an understanding of the scientific disciplines, and biological systems important to modern agriculture. These courses include chemistry, biochemistry, mathematics, soil science, biology, and ecology. For their agricultural specialization, students choose a major emphasis in either agricultural economics, animal sciences, food science, plant sciences, resource sciences, or another closely allied field. In addition to their major area of emphasis, students choose a minor emphasis in either the natural sciences or the social sciences.

Career Alternatives. The agrarian studies major provides a solid background for careers in agriculture, agri-business, government, international services, and teaching.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.)

UNITS

English Composition Requirement	0-8
See College requirement	
Social Sciences and Humanities	42
Cultural anthropology or geography (Anthropology 2 or Geography 2-2G) ..	4
Philosophy of biological sciences (Philosophy 10G or 10H)	4
Introduction to economics (Economics 1A, 1B, Agricultural Economics 120)	14
Restricted Electives	20
Additional courses selected in consultation with adviser in 3 or more of the following fields: agricultural economics, American studies, anthropology, classics, economics, geography, history,	

languages, political science, rhetoric, sociology.

Natural Sciences**67-68**

Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Biochemistry (Biochemistry 101A, 101B) and/or upper division plant or animal physiology	6
Mathematics (Mathematics 16A plus two of the following: Mathematics 16B, Agricultural Science and Management 21, 150, Computer Science Engineering 30).....	10-11
Soil science (Soil Science 100).....	4
Ecology (Plant Science 101 or Environmental Studies 100)	4
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Restricted electives	12
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.....**20**

Perspectives on agriculture (Agrarian Studies 2).....	4
Geography of agriculture (Geography 142)	4
Food and culture (Food Science and Technology 20)	4
History of U.S. agriculture (History 188A, 188B).....	6

Agricultural Specialization**30**

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, international agricultural development.	
Complementary field	12
Senior Honors Thesis (Agrarian Studies 188H) OR 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.	

Unrestricted Electives**12-13**

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; 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 preparation: 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.

188H. Senior Honors Thesis (2-6) I, II, III. Romani

Independent study—2-6 hours; thesis. Prerequisite: Agrarian Studies major; senior standing; overall GPA of 3.25 or higher; consent of master adviser. Two or three successive quarters of guided, scientific and/or scholarly research on an agriculturally-related subject of special interest to the student. (P/NP grading only.) (Deferred grading only, pending completion of thesis.)

Agricultural and Environmental Chemistry (A Graduate Group)

You-Lo Hsieh, Ph.D., Chairperson of the Group
Group Office, 109 Food Science and Technology Building (916-752-1415)

Faculty. Includes members from various departments in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science.

Graduate Study. The Graduate Group in Agricultural and Environmental Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. Study relates to the chemical and biochemical aspects of foods, fibers/polymers, pesticides, and environmental pollution. Detailed information regarding graduate study may be obtained by writing the Group Chairperson.

Graduate Advisers: R.G. Burau (*Land, Air, and Water Resources*), C.S. Ough (*Viticulture and Enology*), C.F. Shoemaker (*Food Science and Technology*), W.W. Winterlin and T. Shibamoto (*Environmental Toxicology*), S.H. Zeronian (*Textiles and Clothing*).

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 faculty member of the Group in Agricultural and Environmental Chemistry. (S/U grading only.)

Agricultural and Managerial Economics

(College of Agricultural and Environmental Sciences)

The Major Program

The major in agricultural and managerial economics teaches students to apply economics and quantitative principles to problems in agricultural production, management, and marketing.

The Program. Each student must specialize in at least one of three options: agricultural economics, which focuses on topics related to the production

*Course not offered this academic year.

and marketing of foods and fibers; consumer economics, which focuses on issues related to consumer decision-making, protection, and welfare; or managerial economics, which focuses on topics related to evaluating, financing, and managing business activities.

Internships and Career Alternatives. Students in agricultural and managerial economics have opportunities to gain additional career information and preparation through internships in a variety of private business and governmental agencies. Graduates qualify for supervisory and management training positions in farm and ranch production, food and agricultural processing, agricultural sales and service, banking, finance, commodity and stock brokerages in the private sector, and a variety of agency career positions in local, state, and federal government. Students who desire additional training are well qualified to enter graduate programs in agricultural economics, economics, business administration, or law.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	3-12
See College requirement	0-8
Additional English (English 1, 3, 20, 102, or 103A-G).....	3-4
Preparatory Subject Matter	35-38
Accounting (Economics 11A-11B).....	8
Computer Science (Agricultural Science and Management 21, Computer Science Engineering 10 or 30).....	3-4
Economic principles (Economics 1A-1B).....	10
Calculus (Mathematics 16A-16B or 21A-21B).....	6-8
Statistics (Statistics 13, 103).....	8
Breadth/General Education	40
<i>(see undergraduate handbook in Department Advising Office for complete list of courses)</i>	
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).	
<i>Note:</i> Approved General Education courses may be used to simultaneously satisfy breadth for the major and the campus General Education requirement.	
Depth Subject Matter †.....	19-21
Micro theory, Agricultural Economics 100A, 100B.....	8
Quantitative methods, Agricultural Economics 106, 155.....	8
Macro theory, Economics 101 or 135.....	3-5
Restricted Electives	28-32
Options (choose at least one):	
(a) Agricultural Economics.....	28
At least 15 units must be chosen from Agricultural Economics 120, 130, 131, 132, 139, 140, 145, 150. The remaining 13 units must be selected from upper division courses in Agricultural Economics and/or Economics.	
(b) Consumer Economics.....	32
At least 15 units must be chosen from Agricultural Economics 118A, 130, 132, 141M, 142, 143, Consumer Science	

†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.

100, 135. The remaining 17 units may be chosen from the aforementioned courses or from Agricultural Economics 120, Applied Behavioral Sciences 171, Economics 121A, 121B, 125, 130, Environmental Studies 160, 168A, 168B, Environmental Toxicology 101, 128, 138, Political Science 100, 174.

(c) Managerial Economics.....32
Agricultural Economics 18.

At least 12 units must be chosen from Agricultural Economics 112, 118A, 118B, 136, 157, 171A, 171B. The remaining 16 units may be chosen from the aforementioned courses or from Agricultural Economics 120, 130, 131, 132, 139, 140, 143, 145, 150, Economics 101, 121A, 121B, 135, 151A, 151B, 160A, 160B, Political Science 174, 188A.

Unrestricted Electives.....37-48
Total Units for the Degree.....180

Advising Center for the major is located in University House Annex (916-752-6185).

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)
Hoy F. Carman, Ph.D., Chairperson of the Department
Department Office, 118 Voorhies Hall (916-752-1517)

Faculty

- Julian M. Alston, Ph.D., Associate Professor
- Steven Blank, Ph.D., Lecturer
- Oscar R. Burt, Ph.D., Professor
- Bayford D. Butler, M.S., Lecturer
- Leslie J. Butler, Ph.D., Lecturer
- Michael R. Caputo, Ph.D., Assistant Professor
- Hoy F. Carman, Ph.D., Professor
- Colin A. Carter, Ph.D., Professor
- Harold O. Carter, Ph.D., Professor
- Roberta L. Cook, Ph.D., Lecturer
- D. Barton DeLoach, Ph.D., Professor Emeritus
- Jerry Foytik, Ph.D., Professor Emeritus
- Benjamin C. French, Ph.D., Professor Emeritus
- Varden Fuller, Ph.D., Professor Emeritus
- Richard D. Green, Ph.D., Professor
- Arthur Havener, Ph.D., Professor
- Thomas W. Hazlett, Ph.D., Associate Professor
- Dale M. Heien, Ph.D., 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 Emeritus
- Catherine L. Kling, Ph.D., Assistant Professor
- Karen Klonsky, Ph.D., Lecturer
- 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., Associate Professor (*Agricultural Economics, Environmental Studies*)
- Marc S. Mangel, Ph.D., Professor (*Agricultural Economics, Zoology*)
- Phillip L. Martin, Ph.D., Professor
- Alexander F. McCalla, Ph.D., Professor
- Chester O. McCorkle, Jr., Ph.D., Professor Emeritus
- Quirino Paris, Ph.D., Professor
- Refugio I. Rochin, Ph.D., Associate Professor

- (*Agricultural Economics; Chicano Studies*)
Richard J. Sexton, Ph.D., Associate Professor
Lawrence E. Shepard, Ph.D., Professor
J. Herbert Snyder, Ph.D., Professor Emeritus
Stephen H. Sosnick, Ph.D., Professor Emeritus
Joe J. Stasulat, Ph.D., Lecturer
J. Edward Taylor, Ph.D., Assistant Professor
Marilyn D. Whitney, 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 Biology 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. Kling; II. Carman; III. Holloway
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. Helfand; 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. Kling; II. Holloway; III. Havener
Lecture—3 hours; discussion—1 hour. Prerequisite:

*Course not offered this academic year.

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. Logan; III. The Staff; summer, _____

Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing or consent of instructor. The role of organizational design and behavior in business and public agencies. Principles of planning, decision making; individual behavior, motivation, leadership; informal groups; conflict and change in the organization.

113. Fundamentals of Marketing Management (4) II. Butler, Bay

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) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Analytical treatment of historical and current economic problems and governmental policies influencing American agriculture. Uses of economic theory to develop historical and conceptual understanding of the economics of agriculture; how public policy influences the nature and performance of American agriculture. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Economics 1A-1B.

130. Agricultural Marketing (4) I. C. Carter; II. Whitney
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. Whitney

Lecture—3 hours. Prerequisite: course 100B; course 130 recommended. Analysis of economic interdependencies among industries, geographically dispersed markets, alternative product forms and markets separated in time.

132. Cooperative Business Enterprises (3) II. Sexton
Lecture—3 hours. Prerequisite: Economics 1A. Study of cooperative business enterprise in the United States and elsewhere; economic theories of behavior, principles of operation, finance, decision-making, and taxation.

136. Managerial Marketing (4) II. The Staff
Lecture—4 hours. Prerequisite: course 100A; Statistics 103. Application of economic theory and statistics in the study of marketing. Marketing measurement and forecasting, market planning, market segmentation, determination of optimal product market mix, sales and cost analysis, conduct of marketing research, marketing models and systems.

139. Futures and Options Markets (3) I. C. Carter
Lecture—3 hours. Prerequisite: course 100A; Statistics 103. History, mechanics, and economic functions of futures and options markets; hedging; theory of inter-temporal price formation and behavior of futures and options prices; price forecasting; futures and options as policy tools.

140. Farm Management (5) III. 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. Heien

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 preparation: non-GE introductory course sequence Economics 1A-1B.

141M. Consumers and the Market (3) II. Heien

Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. Structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. (Students who have had or are taking course 100A, Economics 100, or the equivalent must enroll for this 3-unit course instead of course 141.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: non-GE introductory course sequence Economics 1A-1B.

142. Personal Finance (3) I. Shepard; III. B. Butler; summer, _____

Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Consumer Economics 142.)

143. Investments (3) III. Shepard

Lecture—3 hours. Prerequisite: Agricultural Economics/Consumer Economics 142 or consent of instructor. Survey of investment institutions, sources of investment information, and portfolio theory. Analysis of the stock, bond and real estate markets from the perspective of the investor.

145. Farm and Rural Resources Appraisal (4) I. Johnston

Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. Real estate instruments and elements of real estate finance.

147. Natural Resource Economics (4) I. 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, may receive only 2 units of credit, so must enroll in course 147M instead.)

147M. Natural Resource Economics (2) I. 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.**

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. Paris; II. Howitt; III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A; Statistics 103. Introduction to selected topics in management science and operations research: decision analysis for management, mathematical programming, competitive analysis, and others.

156. Introduction to Mathematical Economics (4) I. Caputo

Lecture—4 hours. Prerequisite: course 100A and 155. Linear algebra for economists; necessary and sufficient conditions in static optimization problems; implicit function theorem; economic methodology and mathematics; comparative statics; envelope theorem; Le Chatelier principle; applications to production and consumer models.

157. Analysis for Production Management (4) III. 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. Wlien

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. Offered in alternate years. (Same course as Environmental Studies 169.)

171A. Financial Management of the Firm (4) I. Sosnick

Lecture—3 hours; discussion—1 hour. Prerequisite: course 106; Economics 11A-11B. Financial analysis at the firm level: methods of depreciation; influence of the tax structure; inventory, cash, and accounts receivable management; sources of short-term and long-term financing, and financial problem solving using a computer spreadsheet program. (Students who have had or are taking Economics 134 may not receive credit for this course.)

171B. Financial Management of the Firm (4) II. Hazlett

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. Larson

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.

***190A. Senior Research Project (2) II.**

Lecture—1 hour; discussion—1 hour. Prerequisite: course 100A; Statistics 103 or consent of instructor; senior standing. Individual student-defined research project conducted under faculty guidance. Problem definition, study objectives, procedure, method of analysis, working outline, and preliminary elements of report writing to be completed in the first quarter. (Deferred grading only, pending completion of sequence.)

***190B. Senior Research Project (2) III.**

Lecture—1 hour; discussion—1 hour. Prerequisite: course 190A or consent of instructor. The research report begun in course 190A will be completed and, after evaluation by the instructor, be revised and resubmitted by the student prior to the end of 190B. (Deferred grading only, pending completion of sequence.)

- 192. Internship (1-6) I, II, III, summer.** The Staff (Chairperson in charge)
Internship—3-18 hours. Internship experience off and on campus in all subject areas offered in the Department of Agricultural Economics. Internships are supervised by a member of the staff. (P/NP grading only.)
- 197T. Tutoring in Agricultural Economics (1-3) I, II, III.** The Staff (Chairperson in charge)
Hours and duties will vary depending upon the course being tutored. Prerequisite: senior standing in Agricultural Economics and consent of Department Chairperson. Tutor will lead small discussion groups affiliated with one of the department's regular courses, under the supervision of, and at the option of the instructor in charge of the course. (P/NP grading only.)
- 198. Directed Group Study (1-5) I, II, III.** The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates (1-5) I, II, III.** The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)
- Graduate Courses**
- 200A. Microeconomic Theory (5) I.** Roemer (Economics), Silvestre (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: graduate standing. Linear and non-linear optimization theory applied to develop the theory of the profit-maximizing firm and the utility-maximizing consumer. (Same course as Economics 200A.)
- 200B. Microeconomic Theory (5) II.** Helms (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A. Characteristics of market equilibrium under perfect competition, simple monopoly and monopsony. Emphasis on general equilibrium and welfare economics; the sources of market success and market failure. (Same course as Economics 200B.)
- 200C. Microeconomic Theory (5) III.** Makowski (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200B. Uncertainty and information economics. Individual decision making under uncertainty. Introduction to game theory, with emphasis on applications to markets with firms that are imperfect competitors or consumers that are imperfectly informed. (Same course as Economics 200C.)
- 204. Microeconomic Analysis (5) I.** Alston
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics 100 or courses 100A-100B and Mathematics 16A-16B; open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Economics 204.)
- 214. Development Economics (4) I.** Jarvis
Lecture—4 hours. Prerequisite: course 100A, 100B, Economics 101; Agricultural Economics/Economics 204 and Economics 160A, 160B recommended. Review of the principal theoretical and empirical issues whose analysis has formed development economics. Analysis of economic development theories and development strategies and their application to specific policy issues in developing country contexts. (Same course as Economics 214.)
- 215A. Agriculture and Economic Development (4) I.** Taylor
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204 and 214. Agricultural development theory and application. Analysis of rural-urban linkages and their role in economic development, food price policy, and interactions between economic development and the environment. Analytical focus on household-farm and intersectoral models. (Same course as Economics 215A.)
- 215B. Open Macroeconomics of Development (4) II.** Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204, 200D or 205, and 214 or 215A. Models and policy

approaches regarding trade, monetary and fiscal issues, capital flows and debt are discussed in the macroeconomic framework of an open developing country. The basic analytical focus is real exchange rate and its impact on sectoral allocation of resources. (Same course as Economics 215B.)

- 215C. Empirical Approaches to Development Analysis (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 215A, 215B. Extension of development models for policy analysis including Household-Farm models, models of resource allocation under uncertainty. Social Accounting Matrix and Computable General Equilibrium models. Analysis and case studies of methods of project evaluation with and without income-distribution weights. (Same course as Economics 215C.)
- 220. Economics of Consumer Policy (3) III.** Sosnick
Lecture—3 hours. Prerequisite: one graduate course in economic theory and one course in econometrics or the equivalent. Policy criteria; sources of market failure; consumer policy alternatives; empirical evaluation of selected economic policies.
- 221. Agricultural Policy in Developed Countries (4) I.** McCalla
Lecture-discussion—4 hours. Economic policy, its nature, formation and analysis; characteristics of agricultural sectors in developed countries; comparative analysis of policies relating to production, marketing, price, income, rural poverty, and resource adjustment; international trade policies for temperate zone agricultural commodities.
- *222. International Agricultural Trade and Policy (4) I.**
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B or Economics 204; Economics 106 or the equivalent. Analysis of country interdependence through world agricultural markets. Partial equilibrium analysis is used to study the impacts of national intervention on world markets, national policy choice in an open economy and multinational policy issues. Offered in alternate years.
- 240A. Econometric Methods (4) II.** Green
Lecture—4 hours. Prerequisite: Statistics 133 and a course in linear algebra or the equivalent. Least squares, instrumental variables, and maximum likelihood estimation and inference for single equation linear regression model; linear restrictions; heteroskedasticity; autocorrelation; lagged dependent variables. (Same course as Economics 240A.)
- 240B. Econometric Methods (4) III.** Havenner
Lecture—4 hours. Prerequisite: course 240A. Covers a variety of topics including analysis of variance, pooled time-series, cross-section estimation, seemingly unrelated regression, classical hypothesis tests, and identification and estimation of simultaneous equation models. (Same course as Economics 240B.)
- 240C. Econometric Theory (4) II.** Wegge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Finite sampling theory; nonlinear and dynamic econometric models; asymptotic distribution theory. (Same course as Economics 240C.)
- 240D. Topics in Econometrics (4) III.** Cameron
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Advanced topics in nonlinear econometric modelling. Contents may vary from year to year. (Same course as Economics 240D.)
- 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.** Paris
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. Caputo
Lecture—4 hours. Prerequisite: course 253. Dynamic programming, Pontryagin maximum principle, and optimal control problem. Emphasis on methods with selected applications to economic problems.

- *255. Systems Analysis and Simulation (3) III.** Logan
Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems.
- 256. Applied Econometrics (4) II.** Heien
Lecture—3 hours; discussion—1 hour. Prerequisite: Master students in agricultural economics or economics, or consent of instructor. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development. (Same course as Economics 256.)
- 257. Analysis and Applications in Production Economics (4) III.** Burt
Lecture—4 hours. Prerequisite: course 204, 252, and 256 or the equivalent. Micro-level analysis of decision problems in agricultural production processes, e.g., investment, resource conservation, pest management, and irrigation scheduling. Covers static and dynamic models under risk and uncertainty and some aggregate aspects of production.
- 258. Demand and Market Analysis (3) III.** Alston
Lecture—3 hours. Prerequisite: course 204 and 256 or consent of instructor. Quantitative and theoretical analysis of the factors affecting supply, demand and price determination for agricultural products. Emphasis on analytical tools for assessing the impacts of changes in government policies and macroeconomic variables.
- 261. Case Problems in Management (3) II.** McCorkle
Lecture—1 hour; discussion—2 hours. Case problem analysis and discussion of business policy and strategy including organization, planning, production, marketing, and financing issues. Emphasis is on problem definition and solution using current examples drawn primarily from agriculturally-oriented firms.
- 263. Agricultural Firm Analysis (3) III.** McCorkle
Lecture—1 1/2 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.**
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) II.** Larson
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. Analysis of Research in Agricultural Marketing (4) II.** Sexton
Lecture—4 hours. Current problems and methods in agricultural market analysis with emphasis on marketing sector firm behavior. Topics include market definition, marketing margins and derived demand, spatial markets, technology analysis, models of imperfect competition, cooperatives, and marketing orders.

283. Analysis of Research in Natural Resource Economics (3) III. 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, extramarket goods, indivisibilities, and intertemporal problems, benefit cost analysis and public and private investment criteria.

284. Applied Demand Analysis (4) III. Green

Lecture—4 hours. Prerequisite: courses 200A, 240A, and 240B. Issues, techniques and methodology currently used in applied demand analysis. Demand parameter estimates will be used to answer various policy questions. Problem identification, model specification, hypothesis stipulation, and econometric estimation of various demand models.

290. Introduction to Research in Agricultural Economics (1) I. 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. H. Carter

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.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Advanced study through special seminars, informal group studies, or group research on problems for analysis and experimentation. Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)

Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis; and (7) Dissertation Research Prospectus. (S/U grading only.)

299D. Special Study for Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Agricultural Education

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of 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 AOB 4). Community College Credentials: Agriculture — J.G. Leising (137 AOB 4).

Courses in Agricultural Education

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, Advising Center, 101 AOB 4.

The Major Program

The agricultural education major trains students to

teach agricultural sciences in high schools or community colleges. In addition, it prepares students for service careers in agriculture. The program combines practical experience and technical course work in agriculture with courses from the natural, physical, and social sciences.

The Program. Students in agricultural education benefit from UC Davis' resources as a world-famous agricultural center. Students may choose to emphasize such areas as plant production, animal production, environmental horticulture, agricultural resource management, or agricultural engineering. It is also possible to complete the requirements for a single-subject teaching credential in general agriculture.

Internships and Career Alternatives. Internships can be arranged in private industries such as nurseries, with farmers or ranchers, in laboratories, and with the Forest Service. As part of the teaching credential program, there are opportunities to observe and work with teachers in high schools. Many agricultural education graduates enter agriculture teaching or pursue a master's degree in agricultural education. Others enter a variety of advanced degree programs in agriculture or environmental sciences. In agriculture production this major is excellent preparation for the future grower, orchardist, or ranch manager. Students can also assume positions in agribusiness firms, such as seed, fertilizer, feed, and machinery businesses, and with agriculture finance firms.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	4-12
See College requirement	0-8
Rhetoric (Rhetoric and Communication 1 or 3)	4
Preparatory Subject Matter	50-51
Biological sciences (Biological Sciences 1A, 1B, and 1C)	15
Chemistry (Chemistry 1A-1B, and 8A-8B or 128A-128B)	16
Computer science (Agricultural Science and Management 21).....	3
Economic principles (Economics 1A or 1B).....	5
Genetics (Genetics 10 or 100).....	4
Mathematics (Mathematics 16A or 21A).....	3-4
Statistics (Agricultural Science and Management 150 or Statistics 13)	4
Breadth/General Education	6-24
Satisfaction of General Education requirement	6-24
Depth Subject Matter	43-51
Education (Agricultural and Home Economics Education 100 and 300, or Applied Behavioral Sciences 175; and Education 110).....	8
Animal science (Animal Science 1 (if no previous course work in Animal Science); Animal Science 2, 41; one of the following: Animal Science 15, 21, 49A, 49B, or 49C).....	11-16
Agricultural economics (Agricultural Economics 130 or 140).....	4-5
Plant science (Plant Science 2; Soil Science 10 or 100; choose one of the following: Environmental Horticulture 10, Vegetable Crops 101, Agronomy 100, Pomology 101, Viticulture and Enology 2 or 116).....	11-13
Agricultural mechanics (Agricultural Practices 49 and 149; Consumer Technology 15 and 16; one of the following: Agricultural Engineering Technology 15, Civil Engineering 10, or Consumer Technology 101).....	10
Specialization	30-32

(To be developed in consultation with faculty adviser.)

Unrestricted Electives10-49
Total Units for the Degree.....180

Major Adviser. J. G. Leising (*Applied Behavioral Sciences*).

Advising Center for the major is located in 101 AOB 4 (916-752-2244).

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, 113 AOB 4. Since many majors in the College do not offer the minimum preparation necessary for entering the Agriculture Credential program, you are encouraged to seek counseling as early as possible. See also 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.G. Leising (*Applied Behavioral Sciences*).

Lower Division Course

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: lower division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

Upper Division Courses

100. Concepts in Education (2) I. The Staff; II. Leising
 Lecture—2 hours; field observations. Prerequisite: upper division standing. Examination of educational institutions. Implications for those entering careers in teaching.

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

***163. Measurement and Evaluation in Teaching** (3) II. The Staff

Lecture—3 hours. Prerequisite: elementary statistics; upper division standing. Development of selection, use and assessment of evaluation procedures for measuring cognitive, affective and psychomotor growth.

171. Audio Visual Communications (2) I, II. The Staff

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. The Staff
 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
 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.

190. Seminar in Agricultural Education (2) I, II. The Staff

Seminar—2 hours. Discussion of selected critical issues in agricultural education. May be repeated for credit with consent of instructor. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

*Course not offered this academic year.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Professional Courses

300. Directed Field Experience in Teaching (2) II, III. The Staff;
Discussion—1 hour; field experience—3 hours. Prerequisite: course 100. Experience as teaching assistant in agriculture or home economics programs in public schools. May be repeated once for credit. (P/NP grading only.)

301. Planning for Instructional Programs (3) III. Leising
Lecture—3 hours. Prerequisite: course 100; course 300 (may be taken concurrently). Major paradigms in program planning and development. Emphasis on key steps in curriculum development, including selection and organization of educational objectives, learning experiences and teaching materials and resources.

302. Teaching Methods in Education (3) III. 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.

306A. Field Experience with Future Farmers of America and Supervised Experience Programs (4) I. Leising
Lecture-discussion—2 hours; field work—6 hours. Prerequisite: acceptance into the Teacher Education Program; course 306B (concurrently). Develop an understanding of the Future Farmers of America and supervised occupational experience programs through planning, conducting, and evaluating actual programs.

306B. Field Experience in Teaching Vocational Agriculture (5-18) I. Leising
Student teaching (corresponds with public school session). Prerequisite: acceptance into the Teacher Education Program; course 306A (concurrently); courses 100, 300, 301, 302. Directed teaching including supervision of occupational experience programs and youth activities in secondary schools or community colleges.

***307. Teaching in Secondary Schools (5-18) I.** The Staff
Student teaching (corresponds with public school session). Prerequisite: acceptance into Teacher Education Program; courses 100, 300, 301, 302. Supervised teaching in secondary school or community college general agriculture or home economics programs. (Deferred grading only, pending completion of course.)

323. Resource Development: Agricultural Education (3) II. Leising
Lecture—3 hours. Prerequisite: courses 306A, 306B. Selection and implementation of community resources in teaching.

***381. Family Life Education (3) III.** The Staff
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 alternate years.

390. Seminar: Issues in Agricultural and Home Economics Education (2) III. The Staff
Seminar—2 hours. Prerequisite: acceptance into the Teacher Education Program; courses 306A-306B or 307. Discussion and evaluation of current issues, theories and research in home economics and agricultural education. (S/U grading only.)

Agricultural Engineering

(College of Agricultural and Environmental Sciences)
Henry E. Studer, M.S., Chairperson of the Department
Department Office, 2030 Bainer Hall (916-752-0102)

Faculty

Norman B. Akesson, M.S., Professor Emeritus
William J. Chancellor, Ph.D., Professor
Pictlaw (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 Emeritus
Mark E. Grismer, Ph.D., Associate Professor
George F. Hanna, M.Ed., Lecturer Emeritus
Bruce R. Hartsough, Ph.D., Associate 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
John M. Krochta, Ph.D., Professor
Coby Lorenzen, Jr., M.S., Professor Emeritus
Kathryn McCarthy, Ph.D., Assistant 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 H. Piedrahita, Ph.D., Assistant Professor
James W. Rumsey, M.S., Lecturer
Thomas R. Rumsey, Ph.D., Associate Professor
R. Paul Singh, Ph.D., Professor
David C. Slaughter, Ph.D., Assistant Professor
Henry E. Studer, M.S., Professor
Shrinivasa K. Upadhyaya, Ph.D., Associate Professor
Wesley W. Wallender, Ph.D., Associate 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

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

103. Hydraulic Power and Controls (1) II. Studer
Lecture-laboratory—2 hours. Prerequisite: upper division standing; Physics 5A. Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling machines.

105. Farm Equipment Management (1) I, II, III. J. Rumsey
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.)

112. Plant and Animal Environmental Control (2) I. Studer
Lecture—2 hours. Prerequisite: Plant Science 2, or Animal Science 1 or 2; or Environmental Horticulture 6. Maintaining optimum environments for plants and animals; animal energetics; psychrometrics; heat and vapor transmission in buildings; temperature and humidity control; greenhouse design; energy conservation; lighting systems; heating, cooling, ventilating principles and equipment.

134. Pesticide Application Techniques (1) II. Giles
Lecture—1 hour. Prerequisite: one course in environmental toxicology, entomology, botany or plant physiology recommended. Basics of agricultural pesticide application. Mechanical systems for safe and effective application of pest control materials. Biological, legal and environmental considerations of pesticide application. Selection and calibration of spray equipment.

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. 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.)

143. Turf and Landscape Irrigation (2) III. Hills
Lecture—2 hours. Prerequisite: Physics 1A or 5A. Basic design, installation, and operation principles of irrigation systems for turf and landscape: golf courses, parks, highways, public buildings, etc. Course emphasis is on hardware associated with sprinkler and drip/trickle systems.

161A. Fundamentals of Aquacultural Engineering (3) II. Piedrahita
Lecture—3 hours. Prerequisite: Biological Sciences 1A, 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) Internship—3-15 hours. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised internship 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. Pest Control Application Technology (3) II. Giles Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Protection and Pest Management 202A or the equivalent. Practical and theoretical considerations of pesticide application systems and techniques. Design, selection, and use of mechanical spray systems for field, orchard, greenhouse, and vector control use. Biological, legal, and environmental considerations in pesticide application.

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, J. Rumsey 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 Balner Hall.

Lower Division Course

49. Field Equipment Operation (2) I, III. J. Rumsey Lecture—1 hour; laboratory—3 hours. Operation, adjustment, and troubleshooting of farm tractors and field equipment. Principles of operation, equipment terminology and uses of tilling, cultivating, thinning, and planting equipment. Typical cultural practices sequences. (P/NP grading only.)

50. Harvesting Machinery Laboratory (1) III. Rumsey Laboratory—3 hours. Prerequisite: course 49 (may be taken concurrently). The function, construction, and operating principles of machines for harvesting fruit, nut, vegetable, and field crops. Laboratories will include operation of the machines to demonstrate concepts. End of quarter field exercise on grain harvesting and baling.

Upper Division Course

149. Field Equipment Maintenance (2) II, J. 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 hardface

ing 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 prepares 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.

The Program. The program in agricultural science and management is designed for students who want a fundamental background in the natural sciences (chemistry, physics, mathematics, biology, botany, microbiology), as well as courses in economics and humanities. After taking preparatory courses, students add to their agricultural background by choosing an area of specialization, and by taking courses in agricultural engineering, soil science, water science, plant pathology, plant physiology, animal science, food science, entomology, and nematology.

Career Alternatives. Job opportunities for agricultural science and management graduates are plentiful. Banking and financial institutions, agribusiness, corporate and privately owned farms, and the U.S. Department of Agriculture are particularly eager to interview graduates with this major. An agricultural science and management graduate who is interested in graduate school has the background to undertake a degree in almost any agricultural area. Advanced degrees open the doors to work with universities as extension specialists, farm advisers, vocational agriculture teachers, and other professional careers.

B.S. Major Requirements:

For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses. Equal courses are acceptable; and a more comprehensive course treatment (e.g., Physics 1A and 1B rather than 1A only) will be useful for some. Students should consider using some portion of their unrestricted elective units to go beyond the minimum requirements shown for the Preparatory and Depth Subject Matter areas.

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	59
Accounting (Economics 11A, 11B).....	8
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Economic principles (Economics 1A, 1B).....	10
Mathematics (Mathematics 16A-16B or the equivalent).....	6
Statistics (Agricultural Science and Management 150).....	4
Breadth Subject Matter	6-24
Satisfaction of General Education requirement.....	6-24
Depth Subject Matter	20-21
Agricultural Economics 100A, 140....	9
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).....11-12

Areas of Specialization.....51-58

Animal Science option.....54

Animal Science 2 (Animal Science 1 recommended).....	4
Genetics 100, Animal Genetics 107.....	9
Nutrition 115.....	4
Physiology 110.....	5
Animal Science.....	20
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; computer science (Agricultural Science and Management 21) recommended.

Food Science option.....54

Biochemistry 101A, 101B.....	6
Chemistry 1C, 5.....	9
Physics 5A, 5B.....	6
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.....56-58

Botany 111, 112; 120 or 121.....	9
Entomology 100-100L or 110.....	4-5
Genetics 100.....	4
Physics 1A, 1B.....	6
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.....51

Agricultural Economics 147.....	4
Agricultural Science and Management 21.....	3
Agronomy 112.....	3
Animal Science 2, 41, 41L, 128.....	11
Botany 111, 117.....	7
Nutrition 115.....	4
Range Science 100, 133, 145, 160.....	12
Resource Sciences 101.....	3
Soil Science 100.....	4

Unrestricted Electives.....10-37

Total Units for the Degree.....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 1202 Meyer Hall (916-752-6118); and peer advising is in 1202 Meyer Hall.

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, 137 Hunt Hall.

Lower Division Course

21. Applications of Microcomputers for Agriculture (3) I, II, III. The Staff (Agronomy and Range Science)

*Course not offered this academic year.

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. Analysis and Simulation of Agricultural Systems (4) I. Plant (Agronomy and Range Science) Lecture—3 hours; discussion-laboratory—1 hour. Prerequisite: course 21 or the equivalent experience with computers; Mathematics 16B. The process of systems analysis, dynamic simulation of crops and biological populations, constructions and use of simulation models for agricultural systems, and an introduction to expert systems and their applications in agriculture.

150. Applied Statistics In Agricultural Sciences (4) I. Geng (Agronomy and Range Science) 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. See the major in Plant Science or Range and Wildlands Science.

Graduate Study. A program of study is offered leading to the M.S. degree in Agronomy. Information can be obtained in the Advising Office at 137 Hunt Hall. Also see the Graduate Division section in this catalog.

Graduate Adviser. R.L. Travis.

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, 137 Hunt Hall.

Lower Division Courses

92. Agronomy Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge) Internship—3-36 hours. Prerequisite: consent of instructor. Internship on or off campus in all subject areas pertaining to agronomy. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

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.

110. Perspectives in Biotechnology (3) II. Valentine Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 10 or Genetics 10. Current issues in biotechnology will be related to their impact on the biological sciences and society. Examples of genetic manipulation through transformation and transfer in agriculture and medicine will be stressed.

111. Cereal Crops of the World (4) III. Qualset Lecture—3 hours; laboratory—3 hours. Prerequisite:

courses 100, 100L; Biological Sciences 1C. 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: Biological Sciences 1C or consent of instructor. Forages as a world resource in food production. Ecological principles governing the adaptation, establishment, growth and management of perennial and annual forages, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock. Offered in alternate years.

113. Fiber, Oil and Sugar Crops in a Changing World (4) I. Rains

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100, 100L; Biological Sciences 1C. 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 alternate years.

***120. Morphology and Reproduction of Agronomic Crops (3) III.** Webster

Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1C 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. Offered in alternate years.

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Internship on or off campus in all subject areas pertaining to agronomy. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Chairperson in charge) Tutoring—1-5 hours. Prerequisite: course to be tutored or the equivalent; upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience. Student will assist in courses under the direction of the faculty. May be repeated for credit up to a total of 5 units. Same course may not be tutored more than one time. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: 6 upper division units of agronomy. (P/NP grading only.)

Graduate Courses

205A. Design, Analysis and Interpretation (3) II. Plant Lecture—3 hours. Prerequisite: Agricultural Science and Management 150. Planning and analysis of field and laboratory experiments with emphasis on concept and technique of designing experiments. Randomized block, factorial, incomplete block and multivariate designs discussed together with appropriate methods of data analysis and interpretation.

205B. Design, Analysis and Interpretation 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.

***207. Plant Population Biology (3) II.** Rice, Jain Lecture—2 hours; laboratory-discussion—1 hour. Prerequisite: advanced undergraduate ecology course (e.g., Environmental Studies 100, Zoology 125,

Botany 117, or Entomology 104); an advanced undergraduate course in genetics and/or evolution (e.g., Genetics 100, 103, or Botany 100). Provides entry-level graduate students and advanced undergraduates with an introduction to both theoretical and empirical research in plant population biology. Emphasis will be placed on linking ecological and genetic approaches to plant population biology. Offered in alternate years. (Same course as Ecology 207.)

***221. Advanced Plant Breeding (4) III.** Teuber Lecture—3 hours; laboratory—3 hours. Prerequisite: course 205A; Genetics 105; Plant Science 113. Philosophy, methods, and problems in developing improved plant species. Topics include: inbreeding, heterosis, progeny testing, breeding methodology, index selection, germplasm conservation, and breeding for stress. Laboratories include tours of breeding facilities and calculation and interpretation of quantitative data. Offered in alternate years.

***222. Quantitative Genetics and Plant Improvement (4) II.** 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 alternate 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 alternate 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 alternate years.

232. Advanced Topics in the Physiology of Crop and Range Plants (3) III. Huffaker Lecture—3 hours. Prerequisite: Botany 112 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 nitrogen-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 111, 112 or the equivalent. Selected aspects of plant growth and development as they relate to crop productivity. Analysis of current literature on shoot and root growth and function, reproduction, senescence, hormonal and environmental controls of development. Offered in alternate years.

290. Seminar in Crop Growth, Production and Utilization (1-2) I. Webster; II. Jackson 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. Qualset; III. Jain Seminar—1-2 hours. Topics of current interest related to plant breeding systems and the origins and evolution of cultivated plants.

297T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Chairperson in charge) Tutoring—1-5 hours. Prerequisite: graduate standing; consent of instructor; and course to be tutored or the equivalent. Designed for graduate students who desire teaching experience but are not teaching assistants. May be repeated for credit for a total of 5

units. Same course may not be tutored more than one time. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge).

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Agronomy and Range Science

(College of Agricultural and Environmental Sciences)

Donald R. Nielsen, Ph.D., Chairperson of the Department

Department Office, 133 Hunt Hall (916-752-1703)

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
Beecher Crampton, M.S., Lecturer Emeritus
Montague W. Demment, Ph.D., Associate Professor
Jan Dvorak, Ph.D., Professor
Shu Geng, Ph.D., Professor
Melvin R. George, Ph.D., Lecturer
Paul L. Gepts, Ph.D., Associate Professor
James E. Hill, Ph.D., Lecturer
Ray C. Huffaker, Ph.D., Professor
Leland F. Jackson, Ph.D., Lecturer
Subodh K. Jain, Ph.D., Professor
Judith A. Jernstedt, Ph.D., Associate Professor
Thomas A. Kerby, Ph.D., Lecturer
Horton M. Laude, Ph.D., Professor Emeritus
William M. Longhurst, Ph.D., Professor Emeritus
Robert S. Loomis, Ph.D., Professor Emeritus
R. Merton Love, Ph.D., Professor Emeritus
John W. Menke, Ph.D., Professor
Duane S. Mikkelsen, Ph.D., Professor Emeritus
Maurice L. Peterson, Ph.D., Professor Emeritus
Donald A. Phillips, Ph.D., Professor
Richard E. Plant, Ph.D., Professor
Y. P. Puri, Ph.D., Lecturer
Calvin O. Qualsef, Ph.D., Professor
Charles A. Raguse, Ph.D., Professor
D. William Reins, Ph.D., Professor
Kevin J. Rice, Ph.D., Assistant 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
Raymond C. Valentine, Ph.D., Professor Emeritus
Barbara D. Webster, Ph.D., Professor
Thea A. Wilkins, Ph.D., Assistant Professor
William A. Williams, Ph.D., Professor
Frederick P. Zschelle, 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 (916-752-3377)

Committee in Charge

Lyn Lofland, Ph.D. (Sociology), Chairperson
Jay Mechling, Ph.D. (American Studies)
Michael Smith, Ph.D. (History)
Patricia Turner, Ph.D. (Afro-American Studies, American Studies)
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
Patricia Turner, Ph.D., Assistant Professor
David Scofield Wilson, Ph.D., Associate Professor

The Major Program

American Studies offers an alternative approach to the study of American experience for students who feel too limited by departmental approaches. Lower division, introductory classes explore the ways in which cultural systems shape and reflect life in the United States. These classes pay close attention to the ways in which differences of class, race, gender, generation, ethnicity, religion, and sexual orientation unevenly affect American lives.

The Program. American Studies majors take five upper division, in-depth classes (see below) and participate in three smaller proseminars limited to majors and devoted to close study of major thinkers and of issues crucial to the practice of American Studies. Advanced work in at least two other departments or programs allows each student to emphasize a period, a problem, or a subject tailored to his or her own individual education goals. Students have the option of writing a senior thesis within this emphasis.

Career Alternatives. As an interdisciplinary program, American Studies provides a good liberal arts and sciences undergraduate education. American Studies maximizes a student's contact with a variety of subject matter and approaches. This flexibility has meant that our graduates have been able to move into a broad range of career settings, including journalism, law, medicine, nursing, law enforcement, environmental planning, teaching, library science, museum curatorship, and business. Some students discover new career possibilities through their internships in American institutions.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
One course from American Studies 1 series.....	4
American Studies 45	4
Two courses chosen from History 17A, 17B, 72A, 72B.....	8
One course chosen from English 30A, 30B.....	4
One course chosen from Anthropology 2, Sociology 2.....	4
Depth Subject Matter	46
American Studies core courses	12
American Studies 110, 120, and 130	8
American Cultural Themes.....	8
Choose any two courses from the 150 series	6
Three Junior Proseminars.....	6
(American Studies 180)	
Emphasis.....	20
In consultation with an American Studies adviser, the student designs a program of 20 units of upper division course work around a unifying theme, period, or subject matter in American civilization. The course work should come from at least two disciplines. The student may choose the senior thesis option (190A-190B) for 8 of these 20 units.	
Total Units for the Major	70

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—3 hours; discussion—1 hour. American science and technology as cultural systems, mutual influence and interaction of those systems with other cultural systems, including religion, social thought, art, architecture, literature, music, and common sense. General Education credit: Contemporary Societies/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.

1C. American Lives through Autobiography (4) II.

Turner
Lecture—2 hours; discussion—2 hours. American culture as understood through the individual life stories told by Americans, with attention to the roles of gender, race, ethnicity, social class, and sexual orientation in the individual's life course.

1E. Nature and Culture in America (4) I. Wilson
Lecture—3 hours; fieldwork—3 hours. Uses and abuses of nature in America; patterns of inhabitation, exploitation, appreciation, and neglect; attention to California; emphasis on metaphor as a key to understanding ourselves and the natural world; attention to models of healing: stewardship, ecology, the "rights" movement. Offered in alternate years.

*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) III. Mechling
Lecture—1 hour; discussion—1 hour. Exploration of the forms wisdom takes in America: folk knowledge, popular belief, prophetic wisdom, public religion, common sense, science, literature; special attention to the grounding of wisdom in circumstance of race, gender, generation, ethnic identity, and region. (P/NP grading only.)

45. Introduction to American Studies (4) I, III. Wilson, Mechling, and staff
Lecture—3 hours; discussion—1 hour. Prerequisite: a course from the course 1 sequence, or Anthropology 2, or Sociology 2. Introduction to interdisciplinary approaches to American civilization; close reading of representative American Studies texts from 1930s to present; special attention to the ways American Studies scholars have dealt with gender, social class, race, ethnicity, region, and age. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: 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 (Chair-

*Course not offered this academic year.

person in charge)

Seminar—3 hours; intensive reading, writing, and special projects. Interdisciplinary group study of special topics in American Culture Studies, designed for non-majors as well as majors. Content will vary according to the instructor and in accord with the following titles: (A) Popular Culture Studies; (B) Women's Studies; (C) Material Aspects of American Culture; (D) American National Character; (E) American Lives Through Autobiography; (F) The Interrelationship Between Arts and Ideas; (G) New Directions in American Culture Studies; (H) Problems in Cross-Cultural American Studies. May be repeated for credit in different subject area only.

110. A Decade in American Civilization (4) I. Mechling

Lecture—2 hours; discussion—2 hours. Close examination of a single decade in American civilization; the connections between the history, literature, arts, customs, and ideas of Americans living in the decade.

120. American Folklore and Folklife (4) II. The Staff
Lecture—3 hours; fieldwork—1 hour. Theory and method of the study of American folk traditions, including oral lore, customs, music, and material folk culture; the uses and meanings of those traditions in various folk communities, including families, ethnic institutions, voluntary organizations, and occupational groups. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: 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) III. The Staff
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 preparation: American Studies 45, Anthropology 2, or Sociology 2.

151. American Landscapes and Places (4) II. Wilson
Lecture—2 hours; discussion—1 hour; fieldwork—3 hours. Prerequisite: course 1 or 45. Comparative study of several American cultural populations inhabiting a region, including their relationship to a shared biological, physical, and social environment, their intercultural relations, and their relationships to the dominant American popular and elite culture and folk traditions.

152. The Lives of Children in America (4) III.

Mechling

Lecture—2 hours; discussion—2 hours. Experience of childhood and adolescence in American culture, as understood through historical, literary, artistic, and social scientific approaches.

***153. The Individual and Community in America**

(4) III. The Staff

Lecture—2 hours; discussion—2 hours. Interdisciplinary examination of past and present tensions between the individual and the community in American experience, as those tensions are expressed in such cultural systems as folklore, public ritual, popular entertainment, literature, fine arts, architecture, and social thought.

180. Junior Proseminar (2) I, II, III. Mechling,

Wilson

Discussion—2 hours. Prerequisite: junior standing in American Studies major. A small-group, intensive study of works frequently cited in American Studies scholarship; emphasis on theory and its application

to American materials. May be repeated for credit with consent of instructor.

190A-190B. Senior Thesis (4-4) I, II, III. Mechling, Wilson

Seminar—2 hours; independent study—2 hours. Prerequisite: senior standing in American Studies major. In consultation with adviser, student contracts to write an extended research paper on a topic mutually agreed upon and enunciated in a prospectus reviewed and accepted by faculty. (Deferred grading only, pending completion of sequence.)

192. Internship in American Institutions (1-12) I, II, III. The Staff (Chairperson in charge)

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. (PNP 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); Cell Biology and Human Anatomy (Medicine, School of)

Anatomy

(School of Veterinary Medicine)

Dallas M. Hyde, Ph.D., Chairperson of the Department

Department Office, 1321 Haring Hall (916-752-1174)

Faculty

George H. Cardinet III, D.V.M., Ph.D., Professor
Sharon L. Cummings, Ph.D., Assistant Professor
Leslie J. Faulkin, Jr., Ph.D., Professor
Dallas M. Hyde, Ph.D., Professor
Ralph L. Kitchell, D.V.M., Ph.D., Professor Emeritus
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. Comparative Organology of Vertebrates (4) II. Plopper

Lecture—3 hours; laboratory—1 hour. Prerequisite: Biological Sciences 1B. Integrative study of the organization of cells and tissues into organs and organ systems in vertebrates. The following organ systems will be compared between fish, birds, and mammals: musculoskeletal, gastrointestinal, cardiovascular, respiratory, integumentary, urinary, reproductive, and nervous.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

202. Organology (2) II. The Staff (Chairperson in charge)

Lecture—2 hours. Prerequisite: course 100 or the equivalent and consent of instructor. Comparative development, growth patterns, and composition of selected organs: liver, kidney, lung, mammary gland, brain, and a skeletal muscle. Offered in alternate years.

205. Ultramicroscopic Anatomy (3) III. The Staff (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 alternate years.

207. Perspectives in Morphological Research (3) III. The Staff (Wu, Tablin in charge)

Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include stereology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in alternate years.

215. Veterinary Histology (6) II. The Staff (Faulkin in charge)

Lecture—3 hours; laboratory—9 hours. Prerequisite: Biological Sciences 1B. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance.

283. Tumor Biology (3) I. The Staff (Faulkin in charge)

Lecture—3 hours. Prerequisite: graduate standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in alternate years.

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 epithelium, nasal cavity structure and function. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Laboratory—6-15 hours. Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

Anesthesiology

See Medicine, School of

Animal Behavior (A Graduate Group)

Benjamin L. Hart, D.V.M., Ph.D., Chairperson of the Group

Group Office, 148 Young Hall (Psychology)
(916-752-1880/1855)

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 specialization: (1) ethology and evolutionary bases of animal behavior, (2) physiological basis of animal behavior, and (3) applied animal behavior. All three specializations emphasize the adaptive and evolutionary bases of animal behavior. Resources available to students, in addition to various departmental facilities, include those of the California 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.

Courses in Animal Behavior

Graduate Courses

201. Scientific Approaches to Animal Behavior Research (3) I. Lott (Wildlife and Fisheries Biology)

Lecture—3 hours. Prerequisite: consent of instructor. Philosophical issues, goals, strategies and tools in field and laboratory research. May be repeated for credit when 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 alternate 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 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, 1202 Meyer Hall.

Upper Division Courses

107. Genetics and Animal Breeding (5) 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.

111. Molecular Biology Laboratory Techniques (4) II. Murray, Oberbauer

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1C; Genetics 100; Biochemistry 101A-101B or Physiological Science 101A-101B. Introduction to the concepts and techniques used in molecular biology; the role of this technology in both basic and applied animal research, and participation in laboratories using some of the most common techniques in molecular biology.

198. Directed Group Study (1-5) I, II, III. The Staff (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 alternate 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 alternate 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 and 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 alternate 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 plasma 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 alternate 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 Physiology

(College of Agricultural and Environmental Sciences)

_____, Ph.D., Chairperson of the Department

Department Office, 196 Briggs Hall (916-752-0203)

Faculty

Marylynn S. Barkley, Ph.D., Associate Professor
James M. Boda, Ph.D., Professor Emeritus
Earl E. Carstens, Ph.D., Professor
Harry W. Colvin, Jr., Ph.D., Professor Emeritus
Perry T. Cupps, Ph.D., Professor Emeritus (*Animal Science*)

Charles A. Fuller, Ph.D., 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 Emeritus (*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., Associate 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
 W. Jeffrey Weldner, Ph.D., Professor
 Charles M. Winget, Ph.D., Lecturer
 Dorothy E. Woolley, Ph.D., Professor

Courses. See the course listings under Physiology (Animal).

Animal Science

(College of Agricultural and Environmental Sciences)
 G. E. Bradford, Ph.D., Chairperson of the Department
 Department Office, 2223 Meyer Hall (916-752-1250)

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
 Patricia J. Berger, Ph.D., Associate Professor
 G. Eric Bradford, Ph.D., Professor
 Dan L. Brown, Ph.D., Associate Professor
 C. Christopher Calvert, Ph.D., Associate Professor
 Floyd D. Carroll, Ph.D., Professor Emeritus
 Ernest S. Chang, Ph.D., Associate Professor (*Biological Sciences*)
 Wallis H. Clark, Jr., Ph.D., Professor (*Biological Sciences*)
 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
 Ian Garnett, Ph.D., Senior Lecturer
 William N. Garrett, Ph.D., Professor
 Dennis Hedgecock, Ph.D., Lecturer
 Hubert Heitman, Jr., Ph.D., Professor Emeritus
 Silas S. O. Hung, Ph.D., Associate Professor
 Robert C. Laben, Ph.D., Professor Emeritus
 Yu-Bang Lee, Ph.D., Professor
 Glen P. Lofgreen, Ph.D., Professor Emeritus
 Joan M. Macy, Ph.D., Professor
 Juan F. Medrano, Ph.D., Assistant Professor
 Verne E. Mendel, Ph.D., Professor Emeritus
 James H. Meyer, Ph.D., Professor Emeritus, Chancellor Emeritus
 Gary P. Moberg, Ph.D., Professor
 James D. Murray, Ph.D., Associate Professor
 Anita M. Oberbauer, Ph.D., Assistant Professor
 James W. Oltjen, Ph.D., Lecturer
 Edward O. Price, Ph.D., Professor
 Wade C. Rollins, Ph.D., Professor Emeritus
 Janet F. Roser, Ph.D., Assistant Professor
 Roberto D. Sainz, Ph.D., Assistant Professor
 Robert W. Touchberry, Ph.D., Professor
 William C. Weir, Ph.D., Professor Emeritus (*Animal Science, Nutrition*)
 Richard A. Zinn, Ph.D., Associate Professor

The Major Program

The animal science major gives students an understanding of animal biology and the proper care of animals and their utilization by people for food, fiber,

work, research, companionship, and recreation.

The Program. Both aquaculture and domestic animal agriculture specializations are available in the animal science major. Upper division students may also choose from numerous electives to further customize their education.

An Animal Science option is also available in the Agricultural Science and Management major. This option places greater emphasis on economics, business and management than the Animal Science major.

Internships and Career Alternatives. Students can arrange internships with the department's herds, flocks, small animal colony, fish hatchery, or at UC field stations or the Bodega Marine Laboratory. Career opportunities for graduates cover a wide range of options from farming and ranching to all of the industries that serve domestic animal agriculture and aquaculture. These include positions in management, sales, financial services, agricultural extension, consulting services, teaching, journalism, laboratory technology, and research. An animal science major is also excellent preparation for veterinary medicine and other professional schools.

B.S. Major Requirements:

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	56
Animal science (Animal Science 1, 2, 41, and 41L).....	12
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Computer science (Agricultural Science and Management 21).....	3
Mathematics (Mathematics 16A-16B or more advanced mathematics courses).....	6
Statistics (Statistics 102 or Agricultural Science and Management 150 or other courses in quantitative skills with prior approval of the master advisor).....	4
Breadth/General Education	6-24
Satisfaction of General Education requirement.....	6-24
Depth Subject Matter	58-68
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 114, 115, 116, 140, 143, 160; and the balance from Animal Science 104, 105, 106, 113, 114, 115, 116, 120, 120L, 123, 124, 128, 131, 133, 135, 140, 143, 148, 160; Microbiology 177, 177L, Animal Genetics 108, Physiology 121, 121L, 130, Nutrition 122, 122L, 123, 124	
OR Aquaculture option, one course from Animal Science 114, 115, 116, 118, 140, 143, 160;	
at least 12 units from Animal Science 104, 105, 106, 120, 120L, 123, 124, 128, 131, 133, 135, 143, 148, Animal Genetics 108, 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

Unrestricted Electives.....**26-56**
Total Units for the Degree.....**180**

Master Adviser. J.M. Macy.

Advising Center for the major is located in 1202 Meyer Hall. Students must secure their academic adviser through this office upon entering the major.

Graduate Study. The Department of Animal Science offers a program of study and research leading to the M.S. degree. 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, II. Famula, Brown/Garnett

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 preparation: Biological Sciences 10.

2. Introductory Animal Science (4) III. Berger
 Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 and Biological Sciences 1A recommended. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; species used in aquaculture; the application of sciences to animal production. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Animal Science 1 and Biology 10.

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) I-II. Van Liew
 Laboratory—6 hours; weekend field trips. Prerequisite: course 21 or the equivalent. Study of individual and group classes of animals with emphasis on visual appraisal of conformation and its accurate description. Course is required for intercollegiate judging competition. (P/NP grading only.)

41. Domestic Animal Production (2) I. DePeters
 Lecture—2 hours. 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
 Discussion—1 hour; laboratory—3 hours. The application of the principles of elementary biology; the art and science of management of beef and dairy cattle, dairy goats, horses, sheep, swine, and laboratory animals. (P/NP grading only.)

92. Internship in Animal Science (1-12) I, II, III. The Staff (Department Chairperson in charge)

Internship—3-18 hours. Prerequisite: consent of instructor. Internship off and on campus in dairy, livestock, and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request form must be met. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

104. Principles of Domestic Animal Behavior (3) I. Price

Lecture—3 hours. Prerequisite: Biological Sciences 1A or 1B or the equivalent. Basic principles of animal behavior as applied to domesticated species. Emphasis will be placed on behavioral development and social behavior. External (exogenous) and physiological mechanisms influencing behavior will be discussed. (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.

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 basic principles of animal science to problems of production of all types of horses. Designed for students who wish to become professionally involved in the horse industry.

116. Beef Cattle and Sheep Production (4) III. Sainz, Zinn

Lecture—3 hours; laboratory—3 hours; one or two Saturday field trips. Prerequisite: course 41; Animal Genetics 107; Nutrition 110 or 115; 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.

120. Principles of Meat Science (3) III. Bandman (Food Science and Technology), Lee
Lecture—3 hours. Prerequisite: Biochemistry 101B or the equivalent. Anatomical, physiological, developmental, and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology, and public health issues associated with meat products. (Same course as Food Science and Technology 120.)

120L. Meat Science Laboratory (2) III. Lee, Bandman (Food Science and Technology)
Discussion—1 hour; laboratory—3 hours. Prerequisite: 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, Oberbauer, Lee

Lecture—4 hours. Prerequisite: Genetics 100, Physiological Sciences 101B or Biochemistry 101B. Basic and practical aspects of prenatal and postnatal growth and development. Emphasis on genetic, hormonal, and biochemical control of meat protein accumulation.

124. Lactation (4) II. Baldwin

Lecture—3 hours; laboratory—3 hours. Prerequisite: Physiology 110; Nutrition 110; or the equivalent background knowledge. Consideration of the biochemical, genetic, physiological, nutritional, and structural factors relating to mammary gland development, the initiation of lactation, the composition of milk and lactational performance.

128. Linear Programming in Animal Agriculture (3) II. Fadel

Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing; Nutrition 110, 115 or the equivalent; understanding of animal production, or consent of instructor. Linear programming in animal agriculture emphasizing farm planning and ration formulation. Provides experience in understanding, developing and applying linear programs.

131. Reproduction and Early Development in Aquatic Animals (4) 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.

143. Pig and Poultry Care and Management (4) I. Garnett, Ernst, Berger

Lecture—3 hours; laboratory—3 hours. Prerequisite: Nutrition 115 or 110; Physiology 110. Care and management of swine, broilers and turkeys as related to environmental physiology, nutrition and metabolism, disease management and reproduction. Saturday field trips.

148. Enterprise Analysis in Animal Industries (4) III. Garnett

Lecture/discussion—4 hours. Prerequisite: course 114 or 116 or 160; course 143. Examination and application of decision making and problem solving in the production enterprise. The areas of production analysis, problem solving, risk analysis and cost-benefit analysis will be examined in terms of the total enterprise.

***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)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Internship off and on campus in dairy, livestock and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request Form must be met. (P/NP grading only.)

197T. Tutoring in Animal Science (1-2) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-2 hours. Prerequisite: Animal Science or related major; advanced standing; consent of instructor. Tutoring of students in lower division animal science courses; weekly conference with instructors in charge of courses; written critiques of teaching procedures. May be repeated once for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

206. Models in Agriculture and Nutrition (3) II. Fadel

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16B; Statistics 108. Basic model building principles and techniques for statistical and systems simulation models. Optimization techniques for non-linear experimental designs and management models are presented. Quantitative analysis and evaluation of linear and non-linear equations used in agriculture and nutrition. Offered in alternate years.

211. Genetic Engineering of Animals (2) III. Murray

Lecture—1 hour; lecture-discussion—1 hour. Review of techniques for the genetic engineering of animals and their limitations and applications. Student lead discussions of recent papers in the field and possible future applications of genetically engineering animals in basic research and applied agricultural and medical research. (SU grading only.)

215. Advanced Concepts of Growth Regulation (3) I. Oberbauer

Lecture—3 hours. Prerequisite: Biochemistry 101B; Genetics 102B; Zoology 121A-121B. Cellular and molecular mechanisms of growth regulation. Topics include cellular proliferation and differentiation in

both tissue culture and animal models. Autocrine, paracrine, and transacting factors are discussed. Emphasis on critical reading and writing, including development of an optional research proposal.

216. Grant Writing Techniques (1) II. Oberbauer Lecture—1 hour. Prerequisite: course 215. Introduction to the peer-reviewed grant writing process. Sources of funding, proposal description, budget calculations, and the review mechanism will be discussed. Proposals written in course 215 will be revised. (S/U grading only.)

235. Advanced Techniques in Animal Nutrition Research (2) I,II,III. The Staff (Calvert in charge) Lecture—1 hour; laboratory—3 hours. Prerequisite: graduate standing and consent of instructor. Application of advanced laboratory techniques to animal nutrition research; use of mechanistic models for experimental design and data analyses; surgical preparations useful in nutrition research; review of current literature. May be repeated for credit when topics differ. (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour. Prerequisite: graduate standing. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (S/U grading only.)

297. Supervised Teaching in Animal Science (2) I, II, III. The Staff (Chairperson in charge) Supervised teaching—6 hours. Prerequisite: consent of instructor. Practical experience in teaching Animal Science at the University level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. An evaluation letter sent to the Graduate Adviser with a copy to the student. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor. (Sect. 1, 2, 3—letter grading; from Sect. 4 on—S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Anthropology

(College of Letters and Science)
Aram A. Yengoyan, Ph.D., Chairperson of the Department
Department Office, 330 Young Hall
(916-752-0745/0746)

Faculty

- John M. Beaton, Ph.D., Assistant Professor
- Robert L. Bettinger, Ph.D., Professor
- David J. Boyd, Ph.D., Associate Professor
- Daniel J. Crowley, Ph.D., Professor (*Anthropology, Art History*)
- Richard T. Curley, Ph.D., Lecturer
- William G. Davis, Ph.D., Professor
- Jack D. Forbes, Ph.D., Professor (*Anthropology, Native American Studies*)
- Charles R. Hale, Ph.D., Assistant Professor
- Sarah B. Hrdy, Ph.D., Professor
- Suad Joseph, Ph.D., Associate Professor
- Smadar Lavie, Ph.D., Assistant Professor (*Anthropology, Center for Comparative Research*)
- Henry M. McHenry, Ph.D., Professor
- Monique Borgerhoff Mulder, Ph.D., Assistant Professor
- David L. Olmsted, Ph.D., Professor
- Peter S. Rodman, Ph.D., Professor
- G. William Skinner, Ph.D., Professor (*Anthropology,*

Center for Comparative Research)

- Carol A. Smith, Ph.D., Professor
- David G. Smith, Ph.D., Professor
- Janet S. Smith, Ph.D., Associate Professor
- Delbert L. True, Ph.D., Professor
- Carolyn F. Wall, Ph.D., Senior Lecturer
- John T. Walton, Ph.D., Professor (*Anthropology, Sociology*)
- Aram A. Yengoyan, Ph.D., Professor

The Major Program

Anthropology is the systematic study of human beings as they live in groups. It is a diverse field and the courses at Davis are subdivided into four categories—biological, social/cultural, linguistics, and archaeology. The student of anthropology learns about human social life—past and present—and gains a broad understanding of humans and society.

The Program. Students interested in the scientific study of human origins, primate studies and the fundamentals of biology as these relate to *Homo sapiens* should enroll in the Bachelor of Science degree program. Students interested in ethnography and the ethnology of selected culture areas or linguistics (language in culture and society and linguistic field methods) should enroll in the Bachelor of Arts degree program. Students interested in archaeology (prehistory and the techniques and methods of archaeology) should consult an adviser before choosing one degree program or the other.

Career Alternatives. Although most practicing anthropologists teach in colleges and universities, a bachelor's degree in anthropology can lead to work in museums, in the Park Service, or in other aspects of public archaeology. A Bachelor of Science degree is a suitable major for premedical and predoctoral preparation. A degree in anthropology with appropriate courses in education also can be good preparation for high school teaching in social sciences or natural sciences.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-39
Anthropology 1, 2, 3, 4	16
Statistics 13	4
Geography 1 or Environmental Studies 30	4
Foreign language (15 units or the equivalent in one language)	0-15
Depth Subject Matter	40
Anthropology 110, 128, 137, 170	16
Linguistic anthropology, one course	4
Biological anthropology, one course	4
Ethnography, one course	4
Archaeology, one additional course	4
An additional 8 units selected from the following: any upper division anthropology course, Art 150, 151, Genetics 100	8
Total Units for the Major	64-79

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	45-56
Anthropology 1, 2, 3, 5	16
Biological Sciences 1A, 1B	10
Chemistry 1A, 1B	10
Statistics 13, 32, or 102	3-4
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 courses 152, 153 and 154A, and the remaining 3 chosen in consultation with major adviser	22-25
Genetics 100 and either Genetics 103 or Zoology 148	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**90-101**

Recommended

Geology 1, 1L, 3, 3L; Physics 5A, 5B, 5C; Psychology 1, 15.

Bachelor of Science List of Courses

Biological 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; Cell Biology and Human Anatomy 101; Physical Education 103, 115; Physiological Sciences 101A, 101B; Physiology 110, 110L; Psychology 108, 112, 150; Statistics 104, 106, 108, 110, 130A, 130B; Zoology 100, 105, 106, 125, 136, 141, 147, 148, 155.

Major Advisers. A.B. degree: R. Curley, D.L.True, C.F. Wall; B.S. degree: H.M. McHenry, P.S. Rodman.

Minor Program Requirements:

	UNITS
Anthropology	19-24
General emphasis	22-25
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, 143, 144, 145, 146, 147, 148A, 148B, 149, 176	4
One course from Anthropology 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 135, 136, 137, 138	4
One additional course from remaining upper division Anthropology courses	4
Biological emphasis	18-21
Anthropology 152, 153, 154A	13
Two additional upper division Anthropology courses chosen in consultation with B.S. degree undergraduate adviser	5-8
Social-Cultural emphasis	18-21
Anthropology 137	4
One course from Anthropology 140A, 140B, 141A, 141B, 141C, 142, 143, 144, 145, 146, 147, 148A, 148B, 149, 176	4
Two courses from Anthropology 101, 114, 117, 118, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 135	8
One additional upper division Anthropology course chosen in consultation with A.B. degree undergraduate adviser	2-5

Teaching Credential Subject Representative.

See also the Teacher Education Program.

Graduate Study. The Department offers a program of study leading to the M.A. and Ph.D. degrees in Anthropology. Further information regarding graduate study may be obtained at the Department Office and at the Graduate Division.

Graduate Adviser. P.S. Rodman.

Courses in Anthropology

Lower Division Courses

- 1. Human Evolutionary Biology** (4) I. McHenry; II. D.G. Smith; III. P.S. Rodman
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. The Staff, III. Curley

Lecture—3 hours; discussion—1 hour. Introduction to cultural diversity and the methods used by anthropologists to account for it. Family relations, economic activities, politics, gender, and religion in a wide range of societies. Current problems in tribal and peasant societies. General Education credit: Contemporary Societies/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. (CAN Anth 6)

4. Introduction to Anthropological Linguistics (4) I. J.S. Smith

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.

15. Behavioral and Evolutionary Biology of the Human Life Cycle (5) I. II. III. The Staff

Lecture—3 hours; discussion—1 hour; term paper. Introduction to the biology of birth, childhood, marriage, the family, old age, and death. Examines comparative characteristics of nonhuman primates and other animals as well as cross-cultural variation in humans by study of selected cases. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: 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/Non-Introductory. Recommended GE preparation: Anthropology 3.

25. Cross-Cultural Communication (4) III. J.S. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, or course 2 and Linguistics 1. Description and analysis of communicative behavior in multi-ethnic societies. Analysis and cross-cultural comparison of linguistic and nonlinguistic communication in face-to-face interaction. Language as a sociocultural resource. Conversation and more formal speech genres. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 4; or Anthropology 2 and Linguistics 1.

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 The Staff

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 Edu-

cation credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: 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.

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.

112. Comparative Linguistics (4) I. Olmsted

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction.

*113. Indigenous Languages of North America (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, Linguistics 1, or consent of instructor. Survey of indigenous languages of North America, including their classification, linguistic characteristics, areal features, and socio-cultural aspects.

*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.

117. Language and Society (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, or Linguistics 1 and course 2. Consideration of language in its social context. Methods of data collection and analysis; identification of socially significant linguistic variables. Contributions of the study of contextualized speech to linguistic theory. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 4 or Linguistics 1.

*118. Language and Ethnicity (4) I. J.S. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, or course 2; Linguistics 1. Exploration of the role of language in creating and maintaining ethnic identity in multiethnic societies. Examination of theoretical approaches to language variation and their utility in the interpretation of patterns of ethnic mother tongue and standard language use across groups.

119. World Writing Systems (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or Linguistics 1. Survey of major world writing systems, including pictographic, syllabic, and alphabetic scripts used in both the Old and New Worlds in ancient and modern times, examined from linguistic and socio-political aspects.

120. Language and Culture (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4; or course 2 and Linguistics 1. Culture, cognition, meaning, and interpretation; language and the classification of experience; communication and learning in crosscultural perspective.

(b) Social-Cultural Anthropology

*121. Folklore (4) III. 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) III. Davis

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Economic behavior in nonindustrial societies; its social and cultural setting and its modern changes.

123. Anthropology and Political Economy (4) II. Hale

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 interrelationships 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 preparation: Anthropology 2.

125. Structuralism and Symbolism (4) II. The Staff
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) I. Boyd

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories of social and economic change. Social and economic consequences of technological innovation. Application of anthropological theory to case studies of rural economy and society.

127. Urban Anthropology (4) II. Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of approaches to urban living: political structures, organization of labor, class relations, world views. The evolution of urban life and its contemporary dilemmas. Cross-cultural comparisons discussed through case studies.

128. Kinship and Social Organization (4) 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. Psychological Anthropology (4) III. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Comparative exploration of the individual in foraging, horticultural, pastoral, agricultural, and industrial societies. Impact of class and state formation, ethnicity, poverty, ruralization, urbanization, economic and political change on the individual. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2, Psychology 15-16, Sociology 2.

130. Gender and Sexuality: Cultural Evolutionary Perspective (4) II. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Gender and sexuality in foraging bands, horticultural and pastoral tribes, agricultural and industrial states. Debates on cultural evolution and distribution of gender hierarchies. Impact of politics, economics, religion, social practices, women's movements on gender and sexuality. Culture, nature and sexuality. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2, Psychology 15-16, or Sociology 2.

*131. Women and Development (4) II. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Current Third World and Western development issues concerning women in agriculture, industry, international division of labor, political movements, revolutions, politics of health, education, family and reproduction. Impact of colonialism, capitalism, the world system, and international feminism on women and development.

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 preparation: Anthropology 2.

134. Race and Sex: Race Mixture and Mixed Populations (4) II. Forbes

Lecture—3 hours; discussion—1 hour. Phenomena of race mixture (miscegenation), interracial marriage, and mixed (hybrid) human populations. Emphasis on social and cultural effects of race mixture and of the interaction of racism and sexual behavior. (Former course 104.)

135. Peasant Society and Culture (4) III. C.A. Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban-rural relations; problems of economic development and culture change. (Former course 162.)

136. Visual Anthropology (4) III. Curley

Lecture—3 hours; discussion—1 hour. Prerequisite: course 128 or 137. Overview of film use in anthropology and its advantages and limitations in comparison to written ethnographic descriptions. Essential features of ethnographic films emphasized. Film production as an aspect of anthropological research and problems encountered in producing films in the field.

137. Theory in Social-Cultural Anthropology (4) I. Yengoyan

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.)

138. Ethnographic Research Methods in Anthropology (4) II. Boyd

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 2 and 137. Basic concepts in and approaches to ethnographic field research. Problem formulation, research design, qualitative and quantitative data collection procedures, and techniques for organizing, retrieving, and analyzing information. Ethnographic description and constructed inference. Students will organize and conduct individual research projects.

***140A. Cultures and Societies of West and Central Africa (4) I. Curley**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of West Africa and Congo Basin with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be the continuities and discontinuities between periods prior to European contact and the present. (Former course 139A.)

140B. Cultures and Societies of East and South Africa (4) I. Curley

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of Eastern and Southern Africa with analyses of selected societies which illustrate problems of interest to anthropologists. Major consideration will be given to continuities and discontinuities between periods prior to European contact and the present. (Former course 139B.)

141A. Indians of North America (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Introductory survey of the Indians of North America: origins, languages, civilizations, and history. (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. (Former course 106B.)

142. Peoples of the Middle East (4) II. Lavie

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Peoples of the Middle East (including North Africa). Discussions of class relations, kinship organization, sex/gender systems, religious beliefs and behavior, ethnic relations, political systems. Impact of world systems, political and religious movements and social change. (Former course 136.)

***143. Ethnology of Southeast Asia (4) I. Yengoyan**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Patterns of culture and social organization from prehistory to the present in the context of historical, ecological, economic, and political settings. Emphasis on the relation of ethnic minorities to national states.

***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.

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.)

146. Indigenous Peoples of Mexico and Central America (4) II. C. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnographic survey of the native peoples of Mexico and Central America: their histories, socio-political organization, mythologies, languages, material culture, writing systems.

147. Peoples of the Pacific (4) 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.

***148A. Traditional Chinese Society (4) III. Skinner**
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Analysis of society, culture, and political economy of late traditional China to 1949. Additional attention given to nature of social change in this pre-modern agrarian civilization.

148B. Communist Chinese Society (4) I. Skinner

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Analysis of sociocultural change and economic development in the People's Republic of China. How the Chinese case relates to social science theory is also addressed.

149A. Traditional Japanese Society (4) III. J. S. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Patterns of culture and social organization from prehistoric to early twentieth-century Japan. Origins, prehistory, and traditional religious and political systems, marriage and kinship, language and culture. Changes and continuities in traditional and contemporary Japanese culture are addressed. Offered in alternate years.

***149B. Contemporary Japanese Society (4) III. J. S. Smith**

Lecture—3 hours; discussion—1 hour. Introduction to contemporary Japanese social structure, social organization, and patterns of culture. Analysis of rural-urban cultural continuities and contrasts, class relations, political and economic systems, kinship, sex/gender systems, contemporary religious beliefs and behavior, conflict, consensus, and cultural stereotypes. Offered in alternate years.

(c) Biological Anthropology***150. Demographic Anthropology (4) III. Skinner**

Lecture—2 hours; discussion—2 hours. Prerequisite: upper division or graduate standing. Comparative examination of population processes—marriage/nuptiality, fertility/reproduction, mortality and migration—in sociocultural context, with emphasis on contrasting family systems. Empirical focus on traditional agrarian societies in East Asia and Western Europe. Biosocial/evolutionary and social science explanations considered.

151. Primate Evolution (4) III. McHenry

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Origin and relationships of the prosimians, monkeys, and apes.

152. Human Evolution and Fossil Man (4) II. McHenry

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Anthropology 1.

153. Human Biological Variation (4) I. D.G. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Biological Sciences 1B. Origin, adaptive significance and methods of analysis of genetic differences among human populations. Special attention will be given to racial differences such as those in blood groups, plasma proteins, red cell enzymes, physiology, morphology, pigmentation and dermatoglyphics. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Anthropology 1.

154A. The Evolution of Primate Behavior (5) I. Rodman

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1. Examines ecological diversity and evolution of social systems of prosimians, monkeys, and apes, placing the social behavior of the primates in the context of appropriate ecological and evolutionary theory.

***154B. Ecology and Sociobiology of Primates (4) III. Rodman**

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A, Statistics 13 (or the equivalent), and consent of instructor. Continuation of course 154A for students interested in methods of studying, describing and analyzing the ecology and sociobiology of primates. Laboratory consists of direct observation of captive primates and local birds with quantitative analysis of observations.

155. Comparative Primate Anatomy (4) II. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: Biological Sciences 1B. The functional anatomy of monkeys, apes, and man. Emphasis on the anatomical evidence for human evolution.

156. Human Osteology (4) III. McHenry

Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or the equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, evolution, dentition, and variations in race, sex, and age.

157. Anthropological Genetics (3) II. D.G. Smith

Lecture—3 hours. Prerequisite: course 1 or Biological Sciences 1A, and Genetics 100, 103, 105, or 106. Processes of micro-evolution responsible for biological differences among human populations. Special attention will be given to the adaptive significance of genetic variation in blood group antigens, serum proteins and red cell enzymes.

***157L. Laboratory in Anthropological Genetics (2)** III. D.G. Smith

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1 or Biological Sciences 1A, and either Genetics 100 or enrollment in course 157 (concurrently or following). Methods for identifying genetic variation in human blood group antigens, serum proteins and red cell enzymes (hemagglutination), general electrophoresis on starch, cellulose acetate and polyacrylamide, immunodiffusion and immunoelectrophoresis on agarose. (P/NP grading only.)

158. The Evolution of Females and Males:*Biological Perspective (4) II. Hrdy**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Current theoretical frameworks for explaining the evolution of sex differences and for understanding the interrelationship between biological processes and cultural construction of gender roles.

(d) Archaeology and Prehistory**170. Archeological Theory and Method (4) II. Bettinger**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 3. Introduction to history and development of archeological theory and method, with particular emphasis on the basic dependence of the latter on the former. Stress is on historical development of archaeology in the New World. (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 alternate years. (Former course 103B.)

***172. New World Prehistory: The First Arrivals (4) II. 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 alternate 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 alternate 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 alternate 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. (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. (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. Archeological 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 alternate years.

***178. Hunter-Gatherers (4) III. Bettinger**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Study and Interpretation of the ancient and modern lifeway in which peoples support themselves with primitive technologies and without benefit of domesticated plants and animals. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2. Offered in alternate years.

179. Ethnoarchaeology (4) II. Beaton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Relationships between behavior and its archeological consequences. Ethnography by archeologists examines residence patterning, site-formation processes, hunting/foraging behavior and other artifact creating activities and how these contribute to modern archeological thinking. (Former course 193.)

181. Field Course in Archeological Method (9)

Summer. The Staff

Lecture—6 hours; daily field investigation. Prerequisite: course 3. On-site course in archeological methods and techniques held at a field location in the western United States, generally California or Nevada. Introduces basic methods of archeological survey, mapping, and excavation. (Former course 195.)

183. Laboratory in Archeological Analysis (4) III.

Bettinger

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 181 or consent of instructor. Museum preparation, advanced field investigation, and guidance in preparation of museum material for publication. May be repeated for credit with consent of instructor. Limited enrollment. (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.

(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; term paper. Historical development of the various fields of anthropology with emphasis upon their interrelationships.

202. History and Theory of Biological Anthropology

(4) III. McHenry

Seminar—3 hours; term paper. History of thought in biological anthropology and analysis of major theoretical problems in the field. Suggested for all first-year graduate students lacking intensive preparation in biological anthropology.

203. History and Theory of Archaeology (3) I. Bettinger

Seminar—3 hours. History of thought in archaeology and analysis of research methods.

204. Contemporary Issues in Anthropological Theory (4) II. Davis

Seminar—3 hours; term paper. Prerequisite: course 2, 137 or consent of instructor. Advanced consideration of fundamental issues in anthropological theory. Emphasis on critical examination of major contemporary debates between proponents of competing theories.

205. History and Theory in Anthropological Linguistics (4) II. J.S. Smith

Seminar—3 hours; term paper. History of thought in anthropological linguistics. Consideration of the historical development of fundamental ideas in anthropological linguistics, of major theoretical issues, and of research methodology.

206. Research Design and Method in Social**Anthropology (5) III. Joseph**

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) III. ———

Seminar—3 hours; term paper. Analysis of various phases of culture, such as religion, economics, law, and folklore. May be repeated for credit when topic differs.

***211. Advanced Topics in Cultural Ecology (3) I.**

Orlove

Lecture—3 hours. Prerequisite: graduate standing; Anthropology/Environmental Studies 133 or the equivalent or consent of instructor. Discussion and evaluation of theories which relate environment, culture, and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. (Same course as Ecology 211.)

216. Problems in Archeological Method (4) II.

Beaton

Seminar—3 hours; term paper. Techniques for analyzing archeological data; application to various prehistoric cultures. May be repeated for credit with consent of instructor.

***217. Andean Prehistory: Theory and Method (4)**

II. True

Seminar—3 hours; term paper. Prerequisite: consent of instructor. Discussion and evaluation of prehistoric occupations in the Andean Region of South America. Emphasis upon Pre-ceramic and early farming peoples.

218. Topics in North American Prehistory (4) II.

True

Seminar—3 hours; term paper. Advanced study on current problems in North American prehistory and archaeology. May be repeated for credit only if material is unique for that student, and with consent of instructor.

220. Field Course in Linguistics (4) III. Olmsted

Seminar—2 hours; laboratory—2 hours. Prerequisite: courses 110, 111. Techniques of eliciting, recording, and analyzing; work with a native speaker.

221. Rural Transformation in Postcolonial Societies (4) II. Orlove

Seminar—3 hours; term paper. Prerequisite: courses 223, 265, or consent of instructor. Problems of rural transformation arising out of political and economic interaction between national elites and rural regional

and local populations under varying conditions of induced change in postcolonial societies. Attention will be given to the implications of this interaction for rapid economic growth. May be repeated for credit.

222. Problems in Urban Anthropology (4) I. Walton Seminar—3 hours; one paper. Prerequisite: graduate status or consent of instructor. Study of selected critical problems in urban anthropology. Each quarter focuses on some of the following topics: class, minorities, poverty, migration, religion, politics, kinship, community, sex-roles, communication, ideology, consciousness in urban context. May be repeated for credit.

***223. Economic Anthropology (4) III.** Davis Seminar—3 hours; term paper. Prerequisite: course 122 or consent of instructor. Selected current methodological and theoretical problems in the analysis of nonindustrial economic systems.

224. Problems in Comparative Religion (4) II. Curley Seminar—3 hours; term paper. Advanced study of current problems in the anthropological study of religion.

***225. State and Nation in the Modern World (4) II.** C. A. Smith Seminar—3 hours; term paper. A presentation of current anthropological theories of the origins and nature of the modern nation-state in both the First and Third Worlds, with special reference to state ideology (nationalism) and forms of control. Offered in alternate years.

226. Consciousness and Resistance (4) III. Hale Seminar—3 hours; term paper. Prerequisite: completion of first-year graduate work or consent of instructor. Consideration of approaches to the study of social inequality, and responses of subordinated groups. Emphasis on situating approaches to contemporary social theory, concrete research problems, and political strategies. Topics: formation of consciousness and identity; collective action, accommodation to frontal resistance.

***232. Political Movements (4) III.** Walton Seminar—3 hours; term paper. Prerequisite: completion of first-year graduate work recommended. Interdisciplinary approach to political movements of protest, reform, and revolution emphasizing historical comparison and evaluation of major theoretical approaches including world systems, resource mobilization, state and culture, rational choice, moral economy, social class and gender.

***239. Problems in African Society and Culture (4) I.** Curley Seminar—3 hours; term paper. Diachronic analyses of traditional institutions in sub-Saharan Africa.

***240. Problems in Afro-American Studies (4) III.** Crowley Seminar—3 hours; term paper. Comparative studies of selected Black communities in the New World.

***241. Topics in North American Ethnology (4) III.** Forbes Seminar—3 hours; term paper. Advanced study on current problems in North American ethnography and culture history. May be repeated for credit with consent of instructor.

***245. Ethnology of Northern and Central Asia (4) II.** Olmsted Seminar—3 hours; term paper. Prerequisite: a reading knowledge of German, Russian, Chinese, or Japanese. Lectures on the culture aboriginally found north of the Caucasus-Korea line. Supervised study of the primary and secondary sources. Work with informants when available.

***246. Ethnology of Europe (4) II.** Olmsted Seminar—3 hours; term paper. Prerequisite: reading knowledge of a European language other than English. Supervised study of the primary and secondary sources dealing with the ethnography and ethnology of the peoples of Europe. Emphasis upon folk, peasant, and minority groups.

252. Human Evolution Seminar (4) III. McHenry Seminar—3 hours; term paper. Prerequisite: course 152 or the equivalent; consent of instructor. Study of selected topics in human evolutionary studies. Each

year course will focus on one or more of the following: molecular evolution, primate evolutionary biology, Tertiary hominoids, *Australopithecus*, *Homo erectus*, archaic *Homo sapiens*, brain evolution. May be repeated for credit.

253. Seminar in Human Biology (4) III. D.G. Smith Seminar—3 hours; term paper. Prerequisite: course 153, 157, or consent of instructor. Study of selected topics in human biology. May be repeated for credit when topics vary. Offered in alternate years.

254. Current Issues in Primate Sociobiology (4) II. Rodman Seminar—3 hours; term paper. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies. May be repeated for credit when different topic covered.

258. Evolution and Human Behavior (4) II. Hrdy Seminar—3 hours; term paper. Prerequisite: courses 15; 101; 154 A or 154B; 158 or consent of instructor. Focus will be on reproductive strategies and parental investment. May be repeated for credit when topics vary.

***265. Concepts and Problems in Applied Anthropology (4) II.** The Staff Seminar—3 hours; term paper. Prerequisite: consent of instructor. Advanced study in culture change; case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.

270. Anthropology Colloquium Seminar (1) I, II, III. The Staff Seminar—1 hour. Reports and discussions of recent advances in the four subfields of anthropology. To be presented by guest speakers. May be repeated twice for credit. (S/U grading only.)

280. Ethnohistorical Theory and Method (4) II. Forbes Seminar—3 hours; term paper. Discussion of the ethnohistorical method; the utilization of diverse types of data, especially documentary sources, to reconstruct socio-cultural history. Particular attention devoted to the applied uses of ethno-history in the solution of contemporary social problems.

292. Seminar in Linguistic Anthropology (4) II. The Staff Seminar—3 hours; term paper. Selected topics in linguistic anthropology. May be repeated for credit when topic differs.

298. Group Study (1-4) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Applied Behavioral Sciences

(College of Agricultural and Environmental Sciences)

Michael P. Smith, Ph.D., Chairperson of the Department

Lawrence V. Harper, Ph.D., Associate Chairperson of the Department

Department Office, 106 AOB 4

Community Studies and Development and Human Development (916-752-0770)

Community Studies and Development

Faculty

Stephen B. Brush, Ph.D., Associate Professor
Isao Fujimoto, M.A., Senior Lecturer S.O.E.

Barbara G. Goldman, Ph.D., Lecturer and Supervisor of Teacher Education

James Grieshop, Ph.D., Lecturer/CE Specialist

Martin F. Kenney, Ph.D., Associate Professor

E. Dean MacCannell, Ph.D., Professor

Marc Pliusek, Ph.D., Professor Emeritus

Michael P. Smith, Ph.D., Professor

Orville E. Thompson, Ph.D., Professor Emeritus

Miriam J. Wells, Ph.D., Professor

Human Development

Faculty

Carolyn Aldwin, Ph. D., Assistant Professor

Louise M. Bachtold, Ed.D., Professor Emeritus

Keith Barton, Ph.D., Professor

Brenda K. Bryant, Ph.D., Professor

James Chisholm, Ph. D., Associate Professor

Lawrence V. Harper, Ph.D., Professor

Glenn R. Hawkes, Ph.D., Professor Emeritus

Rosemarie Kraft, Ph.D., Associate Professor

David B. Lynn, Ph.D., Professor Emeritus

Beth Ober, Ph. D., Assistant Professor

Kay Jeanne Stockman, Ph.D., Lecturer

Jane N. Welker, M.A., Senior Lecturer Emeritus

Emmy E. Werner, Ph.D., Professor

Agricultural Education

Faculty

James G. Leising, Ph. D., Lecturer and Supervisor of Teacher Education

The Major Program

The applied behavioral sciences major is concerned with the study of communities and the people in them. The program focuses on community and organizational development, the role of culture and ethnicity in shaping community life, and the ways that knowledge can be used to solve social problems and improve the quality of life.

The Program. Principal subjects of study within the major are: community and organizational development, social change processes, the role of culture and ethnicity in shaping community life, community research methodologies, the impacts of innovation and technology on community development, and the effects of social, economic and political systems on communities. In addition, the Applied Behavioral Sciences major includes a student-designed field of concentration to complement the student's academic and career interests. Examples of recently approved areas of concentration are: organizational planning and management, aging and community development, community health development, community design and planning, community development and the Asian American, socio-environmental planning, and community education.

Internships and Career Alternatives. Applied Behavioral Science students are required to have an internship in their field before graduation. Internships have been arranged with such agencies as local, county, and state planning units, health departments, schools, housing offices, and community education programs. Applied behavioral sciences graduates are prepared for occupations in community development, social research, program evaluation, organizational and educational consulting, city and regional planning, and community health. The major also provides effective preparation for graduate or professional study in the social and behavioral sciences.

B.S. Major Requirements:

	UNITS
English Composition Requirement	4-12
See College requirement	0-8
Additional English (English 103)	4
Preparatory Subject Matter	22-25
Community development (Applied Behavioral Sciences 1)	4
Computer science (Agricultural Science and Management 21 or Computer Science Engineering 10).....	3
Economic theory (Economics 1A or 1B)....	5
Ethnicity and American communities	

(Applied Behavioral Sciences 2)	4
Social science theory (Anthropology 2 or Sociology 1)	4-5
Statistics (Statistics 13 or 32)	3-4
Breadth/General Education Requirement	24
Satisfaction of General Education requirement to include:	
Sciences and mathematics	8
Humanities (Proficiency in a second language is specifically useful to an understanding of particular aspects of the community. Students planning to work in a minority community are encouraged to select an appropriate language.)	8
Social sciences	8
Depth Subject Matter	39
Methods for community research, Applied Behavioral Sciences 151, and 160 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, 171, 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, 174, 175	4
Evaluation of human service programs, Applied Behavioral Sciences 168.....	4
Applied Behavioral Science seminar: Major Proposal	1
Applied Behavioral Sciences 193,	1
Internship: Applied Behavioral Sciences....	4
Field of concentration	37
Additional upper division courses related to the major, determined in consultation with faculty adviser. (Up to 5 units of variable-unit course work may be counted toward this requirement, e.g., Applied Behavioral Sciences 159, 192, 196, 197, 199.)	
Unrestricted Electives	43-54
Total Units for the Degree	180

Other Requirements

In consultation with a faculty and staff adviser, Applied Behavioral Sciences majors must develop a program of study which will comprise an area of specialization. Students must submit a written proposal for the major to be reviewed by a faculty committee.

Major Adviser. M. Wells.

Advising Center for the major is located in 101 AOB 4 (916-752-2244).

Minor Program Requirements:

The Applied Behavioral Sciences faculty offers the following minor program:

	UNITS
Community Development	24
Applied Behavioral Sciences 1, 151, 152, 164	16
Two courses selected from the 160 and/or 170 series.....	8
(a) Applied Behavioral Sciences 162, 163, 168	
(b) Applied Behavioral Sciences 171, 172, 173, 174, 175, 176, 178.	

Minor Adviser. E.D. MacCannell.

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 preparation: Anthropology 2.

17. Population and Community (2) II. Fujimoto

Lecture—2 hours. Dynamics and challenges offered by demographic changes in California and the world community. Implications for individuals and communities. Special emphasis on the possible contributions each individual can make towards resolving global problems related to human ecology through local community action. (P/NP grading only.)

18. Science and Society (3) III. The Staff

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)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

98. Directed Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

118. Technology and Society (4) II. Kenney

Lecture—3 hours; discussion—1 hour. Prerequisite: course 18 or consent of instructor. Impact of technology on labor relations, employment, industrial development and international relations. The internal relations of technology development and deployment.

140. Political Economy of Regional Development (4) II. Kenney

Lecture—4 hours. Prerequisite: one undergraduate economics, agricultural economics or political science course, or consent of instructor. Political economy of domestic regional development. Technology, labor relations and interfirm linkages. California and other regions as case studies.

151. Community 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 preparation: 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 132, 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 preparation: Applied Behavioral Sciences 151, Anthropology 2, or International Agricultural Development 10.

154. Semiotics, Structuralism and Soclocultural 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 preparation: Anthropology 2 or Sociology 2.

157. Politics and Community Development (4) III. Smith

Lecture—4 hours. Prerequisite: prior course work in sociology or political science recommended. Analyzes political, economic and sociocultural forces shaping the form and function of local communities in the U.S. Considers theories of the state, the community and social change and case studies of actual community development in comparative historical perspective.

159. Field Experience in Community Development (4) I. Fujimoto; II. ———, III. The Staff

Discussion—2 hours; field work—8 hours. Prerequisite: any one of courses 151, 152, 153, 154, or 157. Field involvement with community or organizational issues or problems and their resolution. May be repeated for credit for a total of 12 units with consent of instructor.

160. Research Design and Method in Community Studies (4) III. The Staff

Lecture—4 hours. Prerequisite: course 1; Statistics 13 or the equivalent. Application of behavioral science research methodology to multidisciplinary problems confronting communities and community organizations. Focuses on design, sampling, measurement and analysis.

161. Ethnographic Research in America (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: completion of 8 units of course work in Anthropology, Sociology, or Applied Behavioral Sciences. Methodologies, ethics and goals of qualitative research. Emphasis on analyzing and conducting ethnographic research in American communities; problem formulation, analytic modes, data correction and interpretation. Offered in alternate years.

162. People, Work and Technology (4) I. Wells
Lecture—4 hours. Prerequisite: course work in the social sciences (e.g., Sociology 1, 3, Anthropology 137, Economics 1A, 1B) or labor history. Relationship between work, technology, and people's lives. Such topics as industrialization, bureaucratization, automation, the structure of work-linked communities, education and the labor market, work and the economic system and the future of work.

*163. Behavior of Community Organizations (4) I. The Staff

Lecture—4 hours. Prerequisite: introductory social sciences course. How community organizations function and how members of organizations interact

with each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power.

164. Theories in Organizational Change (4) II. The Staff

Lecture—4 hours. Prerequisite: course 1 or 2. Development of approaches to planned change including normative re-educative, applied systems, and developmental strategies.

168. Program Evaluation and the Management of Organizations (4) I. Goldman

Lecture—4 hours. Prerequisite: courses 160, 161. Role of program evaluation in organizational and program management. Impact of internal evaluation in program planning, improvement, and accountability.

***170. Communication of Innovations (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and course work in the social sciences; course 1 or Sociology 1 recommended. Information exchange and innovation diffusion in organizational and social settings. Exploration of the role of information networks and communication channels in planned social change efforts. Philosophical consideration of the consequences of innovation dissemination.

171. Housing and Social Policy (4) III. Wells

Lecture—4 hours. Social impact, economics, and politics of housing in the United States. Special attention given to alternative policy strategies at the national levels.

172. Social Inequality: Issues and Innovations (4) III. Wells

Lecture—4 hours. Prerequisite: upper division standing; 8 units of sociology or anthropology or combination. Study of the phenomenon of inequality in the U.S. Various approaches to inequality will be examined, including structural and historical explanations, prejudice and discrimination, the "culture of poverty," and arguments concerning race, sex, and genetic potential.

173. The Continuing Learner (4) II. The Staff

Lecture—4 hours. Prerequisite: upper division standing. Theories of adult learning and teaching emphasizing the role of adult education in the community. Designing of adult education programs.

174. Communication for Community Change (4) I. The Staff

Lecture—4 hours. Prerequisite: course 1. Communication as a mechanism and method for creating change in communities. Theories and practices; impact of message on attitudes and behavior; ethics of change induced through communication. Offered in alternate years.

***175. Education in the Community (4) I.** Grleshop

Lecture—4 hours. Prerequisite: upper division standing and course work in the social sciences; course 1 or Sociology 1 recommended. Function of education in the community. Relationships of community and non-formal education to formal education, schooling and to individual, community and national development. Planning process and role of education in social and community change. Offered in alternate years.

176. Comparative Ethnicity (4) 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.

178. Social Networks and Community Health (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Sociology 2. Relevance of social ties to the health of the individual, family and community. Multidisciplinary look at forces affecting family and friendship ties, as well as community services; and at how social bonds affect physical and psychological health. General Education credit: Contemporary

Societies/Non-Introductory. Recommended GE preparation: 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.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. 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—4 hours. Prerequisite: graduate standing; knowledge of social science research methodology. Focuses on theoretical formulations and methodological considerations when designing evaluation research studies for social programs. Includes examination of relationship between organizational planning, decision-making and evaluation research; value conflicts; multiple information requirements; social and political environment influencing evaluation studies.

240. Community 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. Kenney

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. The Staff

Seminar—4 hours. Prerequisite: course 241. Planning, organization, financing and administration of social change projects or programs at the community or city level.

243. Professional Skills for Human Service and Community Development (4) I. The Staff

Lecture—2 hours; seminar—2 hours. Prerequisite: graduate student standing in a social science discipline. Theory of interpersonal communication and small group process as applied to development of professional skills as community developer, program administrator and/or consultant.

***244. The Political Economy of Domestic Development (4) III.** Kenney

Lecture—4 hours. Prerequisite: course 241. Examination of the politics and institutions affecting the economic growth of regions. Theories of development and change are examined with specific reference to case study material.

245. The Political Economy of Urban and Regional Development (4) II. Smith

Lecture—4 hours. How global policies and economic restructuring and national and state policies are mediated by community politics; social prediction of urban forces; role of the state in uneven development; dynamics of urban growth and decline; regional development in California.

290. Seminar (1) I, II, III. The Staff

Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

297. Practicum in Community Development (2) I, II. The Staff

Seminar—2 hours. Prerequisite: course 243 and field placement in community human service agency. Application of theories and approaches of community development through field placement in a community or human service agency. Further development of skills as change agents in community settings. Consideration of the field placement as it relates to relevant research. May be repeated for a maximum of 4 units. (S/U grading only.)

298. Group Study (1-5) I, 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)

John K. Hunter, Ph.D., Chairperson of the Group
Group Office, 551 Kerr Hall (916-752-8131)

Faculty. Consists of members from a variety of departments whose research interests are mathematically oriented. Departments represented include Agricultural Economics, Biological Sciences, Chemistry, Computer Science Engineering, Chemical, Civil, Electrical, and Mechanical Engineering, Environmental Studies, Epidemiology and Preventive Medicine, Genetics, Land, Air and Water Resources, Management, Mathematics, Obstetrics and Gynecology, Statistics, Wildlife and Fisheries Biology, and Zoology.

Graduate Study. Students prepare for careers relat-

ing to the application of mathematics to problems in the physical and life sciences, engineering, and management. The degree requirements consist of two years of rigorous training in applied mathematics followed by course work and a research dissertation under the direction of a member of the Applied Mathematics Graduate Group. The M.S. degree provides preparation (1) for further study in applied mathematics or an application area, or (2) for a career in industry or public service. The Ph.D. degree provides preparation for a career in research and/or teaching. Areas of research in the program include differential equations, fluid mechanics, numerical analysis, operations research, systems theory, probability and stochastic processes, mathematical biology, and mathematical physics. Detailed information may be obtained by writing to the Graduate Coordinator, Department of Mathematics.

New applicants are admitted to the fall quarter *only*.

Preparation. The program encourages application from students who have prior training in engineering, physical and life sciences, mathematics, economics, and related fields. Applicants must have completed two years of undergraduate mathematics including linear algebra, differential equations, vector calculus and a rigorous course in advanced calculus is encouraged.

Graduate Advisers. A. Cheer (Mathematics); A.M. Hastings (Environmental Studies).

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

Mary H. Fong, Ph.D., Director, Program in Art History
Department Office, 111A Art Building
(916-752-0105)

The Department of Art offers two separate undergraduate majors, one in art studio and one in art history, each leading to the Bachelor of Arts degree. The department also offers graduate work in art studio leading to the Master of Fine Arts and in the history of art leading to the Master of Arts.

Art History

Faculty

Joseph A. Baird, Ph.D., Professor Emeritus

Daniel J. Crowley, Ph.D., Professor (*Art, Anthropology*)

Mary H. Fong, Ph.D., Professor

Robert J. Grigg, Ph.D., Associate Professor

Seymour Howard, Ph.D., Professor

Dianne Sachko Macleod, Ph.D., Associate Professor

Jeffrey Ruda, Ph.D., Associate Professor

Deborah Weiner, Ph.D., Assistant Professor

The Major Program

Art History is the study of the visual arts in civilization. It examines changing aesthetic and cultural values and significant material and ideological developments as seen in works of art and architecture. It emphasizes visual as well as verbal intelligence, providing more than the standard advantages of liberal arts training.

The Program. The student majoring in art history begins with courses which survey the arts of Asia, Europe, and America. More specialized courses follow in ancient, Byzantine, medieval, Renaissance, baroque, modern, Non-Literate, Oriental, and American art and architecture. At the same time students are encouraged to take classes in related disciplines such as religion, history, philosophy, literature, and foreign languages.

Career Alternatives. The major prepares students for advanced study either in graduate school, or in professional programs. It can also serve as the foundation for careers in teaching, research, museums, galleries, arts administration, art criticism, publishing, and art investment.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	28
Art 1A, 1B, 1C, 1D, 25.....	20
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 six 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	
(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). Students participating in this Program are candidates for Departmental recommendation for graduation with High or Highest Honors. See the Letters and Science section of this catalog and consult the department for more information.

Teaching Credential Subject Representative. Department Chairperson. See also the Teacher Education Program.

Graduate Study. The 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. (CAN Art Seq A)

1AG. Writing: On Ancient Art (I) I. The Staff

Discussion—1 hour; short papers. Prerequisite: course 1A (concurrently). Small group discussions and preparation of short papers for course 1A. General Education credit with concurrent enrollment in course 1A: Civilization and Culture/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. (CAN Art Seq A)

1BG. Writing: On Medieval-Renaissance Art (1) II. Grigg

Discussion—1 hour; short papers. Prerequisite: course 1B (concurrently). Small group discussions and preparation of short papers for course 1B. General Education credit with concurrent enrollment in course 1B: Civilization and Culture/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. (CAN Art Seq A)

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 course 1C. 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 course 1D. General Education credit with concurrent enrollment in course 1D: Civilization and Culture/Introductory.

10H. Introduction to Art: Art and Civilization (4) II. 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 alternate years.

25. Introduction to Architectural History (4) I. 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) I. 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 (Program Director in charge)

Prerequisite: consent of instructor. Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Program Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150. Arts of Sub-Saharan Africa (4) III. Crowley

Lecture—3 hours; term paper or gallery studies and review. Traditional arts and crafts of sub-Saharan Africa; particular attention to the relationships between sculpture and culture in West and Central Africa.

151. Arts of the Indians of the Americas (4) II. The Staff

Lecture—3 hours; term paper or gallery studies and review. Development of art in North America, emphasizing ancient Mexico. South American relationships and parallels. Recent and contemporary Indian arts and crafts from Alaska to Chile.

***152. Arts of Oceania and Prehistoric Europe (4) III.** Crowley

Lecture—3 hours; term paper. Traditional arts of aboriginal Australia, Melanesia, Polynesia, and Micronesia, as seen in their cultural contexts. Prehistoric art of Europe and the Near East.

154A. Early Greek Art and Architecture (4) 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) III. Fong

Lecture—3 hours; term paper or gallery studies and review. A survey from the beginning to the twelfth century focusing on the major art forms that are traditionally known as well as newly discovered through archaeology in China.

163B. Chinese Painting (4) II. Fong

Lecture—3 hours; term paper or gallery studies and review. The unique form of ink painting, with or without colors, depicting human and animal figures, flowers-and-birds, and landscape—the favorite and enduring theme of the Chinese scholar-painter.

163C. Painting in the People's Republic of China (4) III. Fong

Lecture—3 hours; term paper. Prerequisite: course

1D or 163B. Analysis of the interaction between art and politics in the emergence of China into the modern world. Integration of Western influence, implementation of Mao Zedong's thought on art, and the formation of contemporary Chinese painting.

***164. The Arts of Japan (4) III.** 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) III.** 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 alternate years.

176A. Art of the Middle Ages: Early Christian and Byzantine Art (4) I. Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire: through the later Roman Empire in the West and to the final capture of Constantinople in the East.

***176B. Art of the Middle Ages: Early Medieval and Romanesque Art (4) III.** Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century.

176C. Art of the Middle Ages: Gothic (4) II. Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in northern Europe from the twelfth through the fifteenth centuries.

***177A. Northern European Art (4) III.** Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the fifteenth century in Austria, Germany, France and the Lowlands, including such artists as Jan van Eyck and Hieronymus Bosch.

177B. Northern European Art (4) III. Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the sixteenth century in Germany, France and the Lowlands, including such artists as Albrecht Dürer and Pieter Bruegel.

***178A. Italian Renaissance Art (4) I.** Ruda

Lecture—3 hours; term paper or gallery studies and review. Giotto and the origins of the Renaissance; painting and sculpture in Italy from Nicola Pisano through Lorenzo Monaco, with emphasis on Duccio, Giotto, and other leading artists of the early fourteenth century.

178B. Italian Renaissance Art (4) I. 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 preparation: 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) I. Ruda

Lecture—3 hours; term paper or gallery studies and review. Seventeenth-century painting, including such artists as Caravaggio, Rubens, Rembrandt, and Velázquez. Offered in alternate years.

***182. British Art (1750-1914) (4) III.** Macleod

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1C. Analysis of the place of art in British culture — 1750 to 1914. Topics include influence of class and gender on art education, patronage, and

exhibition societies. Artists: Hogarth, Turner, Pre-Raphaelites, and lesser-known advocates of military, social realist, and colonial themes.

183A. Art in the Age of Revolution (4) I. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Analysis of political and stylistic implications of European painting from 1750 to 1860. Artists studied include Goya, David, Delacroix, Constable, Turner, the Pre-Raphaelites, and Courbet.

183B. Impressionism and Post-Impressionism (4) II. Macleod

Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Social and cultural study of major European art movements between 1860 and 1900, including an examination of the paintings of Manet, Monet, Renoir, Whistler, Gauguin, van Gogh, Cezanne, and Redon.

***183C. Modern Art: 1900-1945 (4) I.** Macleod

Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Examination of modern movement in European art from Fauvism and Cubism to Surrealism and Abstract Expressionism (1900-1945). Artists studied include Picasso, Matisse, Kandinsky, Malevich, and Pollock.

183D. Modern Sculpture (4) II. Howard

Lecture—3 hours; term paper or gallery studies and review. Sculpture from Neo-Classicism to the present.

***183E. Contemporary Art: 1945 to the Present (4) 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, Earthworks, and Feminist art.

183F. The Tradition of Modernism (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 183A, 183B, 183C, or 184. Introduction to the artistic movements which traditionally constitute twentieth-century Modernism. Study will be divided into sessions dealing with formation of such avant-garde movements as Cubism and Surrealism, and sessions critically examining the emergence of individual artists as representatives of such movements.

184. Twentieth Century Architecture (4) II. Weiner

Lecture—3 hours; term paper. Prerequisite: course 25 recommended. Major movements in architecture of the twentieth century in Europe and America. Formal innovations are examined within the social, political, and economic circumstances in which they emerged.

***186. After Modernism: 1968 (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: background course in modern European history and philosophy recommended. Covers critical theory, focusing on the decade following events of 1968. Examines emergent critique of culture in relation to legacy of Frankfurt School, late structuralist thought, pop art, conceptual art, performance actions, and Fluxus movement.

***187. Word and Image in German Modernism (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: background course in modern European history and philosophy recommended. Covers critical theory dealing with links between visual and textual production within the alternative tradition of European modernism. Images and key texts of Expressionism, Blue Rider, Dada, Bauhaus, N.S. Fascism, Weimar Film, and Post War Restoration examined.

188B. Architecture of the United States (4) I. Weiner

Lecture—3 hours; term paper. Prerequisite: course 25 recommended. American architecture from the first European settlers to Postmodernism. Technological and formal developments will be examined within the social, political, and economic context in which they emerged. Issues include ideals of domesticity and the development of the architectural profession.

188C. Painting of the United States (4) II. Macleod
Lecture—3 hours; discussion—1 hour; term paper or
gallery studies and review. American pictorial devel-
opment from 1650 to the present, with emphasis on
twentieth-century developments.

***190. Undergraduate Seminar (4) II.** The Staff (Pro-
gram Director in charge)
Lecture—3 hours; term paper. Prerequisite: consent
of instructor. Intended primarily for senior and junior
students in the history of art. Assigned readings, dis-
cussions, and a substantial paper in a particular
area of art history will introduce the student to
methodology and techniques of art historical
research. May be repeated once for credit. Limited
enrollment.

192. Internship (2-12) I, II, III. The Staff (Program
Director in charge)
Internship—term paper or catalogue. Supervised
program of internships at professional art institutions
such as museums, galleries, and art archives includ-
ing collections of slides and photographs. May be
repeated once for credit. (P/NP grading only.)

194H. Special Study for Honor Students (4) I, II, III.
The Staff
Independent study—12 hours. Prerequisite: course
190 or the equivalent, as determined by the major
adviser. Open only to students in the Art History Hon-
ors Program. Independent study of an art historical
problem culminating in the writing of an honors the-
sis under the supervision of a faculty guidance com-
mittee.

198. Directed Group Study (1-5) I, II, III. The Staff
(Program Director in charge)
(P/NP grading only.)

**199. Special Study for Advanced Undergraduates
(1-5) I, II, III.** The Staff (Program Director in charge)
(P/NP grading only.)

Graduate Courses

200. Introduction to Art Historical Research (4) I.
The Staff
Seminar—4 hours. Introductory sampling of major
writings, methods, and sources used for research in
the discipline of art history.

250. Problems in Art Historical Research (4) III.
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; term paper. Selected areas of
special study in the arts of Africa, Oceania, and Pre-
historic 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) III.** 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) II. 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) II.**
Fong
Seminar—3 hours; term paper. Selected topics in
European and American art which demonstrates an
assimilation of oriental art. May be repeated for cred-
it with consent of instructor.

***276. Seminar in Medieval Art (4) II.** Grigg
Seminar—3 hours; term paper. Selected areas of
special study in medieval art from Early Christian to
late Gothic. May be repeated for credit with consent
of instructor.

277. Seminar in Northern Renaissance Art (4) I.
Grigg
Seminar—3 hours; term paper. 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) III.

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.

***286. After Modernism: The Eighties (4) III.** The
Staff
Seminar—3 hours; term paper. Prerequisite: course
186; course 183A, 183B, 183C, or 184 recommend-
ed. Selected areas of special study of post-structu-
ralist critiques converging on visual production and
analysis; aspects of signification and discourse, fem-
inist critiques and gender theories, semiotics and
deconstruction; works of art relating to sexual identi-
ties and images, and recuperation of painting.

**288. Seminar in European and American Archi-
tecture (4) II.** Weiner
Seminar—3 hours; term paper. Exploration of select-
ed 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 (Pro-
gram Director in charge)
(S/U grading only.)

Professional Course

**390. Introduction to Teaching Art History for
Teaching Assistants (1) I, II, III.** The Staff
Discussion—1 hour. Designed for teaching assis-
tants with emphasis on problems and procedures
encountered by teachers of undergraduate art histo-
ry. (S/U grading only.)

Professional Courses

***401. Museum Training: Curatorial Principles (4)**
II. Amerson
Seminar—3 hours. Approved for graduate degree
credit. Study of private and public collections. Muse-
um personalities. Appraisal of works of art; ethics of
appraisal. Auction and sales: methods and cata-
logues. Registration. Technical problems of the
museum. Connoisseurship. Collateral reading. Visits
to museums. Seminar with assigned papers.

402. Museum Training: Exhibition Methods (4) II.
Amerson
Seminar—3 hours; exhibition. Approved for graduate
degree credit. History of exhibition methods in
private and public collections. Comparisons of different
types of museums and their exhibition problems.
Lighting and techniques of display with emphasis on
actual design. Experimentation with unusual presen-
tation forms.

*Note: Various of the above courses are not offered
each year; please check quarterly schedules.*

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 Emeritus
- Squeak Carnwath, M.F.A., Associate Professor
- Richard D. Cramer, M.F.A., Professor Emeritus
- Roy DeForest, M.A., Professor
- William Henderson, M.F.A., Professor
- Harvey Himelfarb, M.A., Professor
- David Hollowell, M.F.A., Associate Professor
- Ralph M. Johnson, M.A., Professor Emeritus
- Manuel J. Neri, Professor Emeritus
- Roland C. Petersen, M.A., Professor Emeritus
- Lucy A. Puls, M.F.A., Assistant Professor
- Irit Rogoff, Ph.D., Assistant Professor
- Cornelia Schulz, M.F.A., Professor
- Wayne Thiebaud, M.A., hon. D.F.A. (C.C.A.C., D.C.)
Professor Emeritus
- Baochi Zhang, M.F.A., Assistant Professor

The Major Program

The studio art major provides the knowledge and
experience necessary for a broad understanding of
the visual arts.

The Program. For the beginning student, the major
offers an introduction to drawing, composition, sculp-
ture, and art history. Students may then advance to
more specialization (painting, sculpture, printmaking,
ceramics, photography, film making, as well as theo-
ry and criticism) in upper-division work.

Portfolios. Students at Davis should keep a contin-
ing portfolio of their art work which is subject to fac-
ulty perusal at such times as when the student is
declaring the major, trying to add the first day of
class (the department gives preference to students
who have pre-enrolled), and requesting independent
study courses.

Career Alternatives. The studio art graduate is pre-
pared for graduate work or continuing development
as a professional artist or art teacher. Students who
have career aspirations in the commercial aspects of
the visual arts can acquire a broad general educa-
tion and a creative foundation in the art studio major,
establishing a basis for further specialization in com-
mercial art.

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 instruc- tors, chosen from Group A, Practice of Art.....	24
One course from Group B, Theory and Criti- cism.....	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 recommend-
ed);
- (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 permis- sible).....	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 Edu-
cation Program.

Graduate Study. The Department of Art offers pro-
grams 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.** Henderson, Shulz, Zhang
and staff
Laboratory—8 hours; to be arranged—4 hours. Form
and composition in black and white. (CAN Art 8)

*Course not offered this academic year.

3. Drawing II (4) I, II, III. Hollowell, Henderson & staff Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form and composition in color.

4. Life Drawing (4) I, II, III. Hollowell, Thiebaud & staff Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form in composition using the human figure as subject.

5. Sculpture (4) I, II, III. Puls, Zhang & staff Laboratory—8 hours; to be arranged—4 hours. Form in space using plaster and other media. (CAN Art 12)

***10S. Introduction to Art Appreciation:** (4) I. 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. Hollowell & 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.

Preenrollment in upper division courses is restricted to art majors. Art minors may obtain permission to preenroll by filling out a "Waiver of Restriction" form in the Art office.

Group A: Practice of Art

101. Painting: Materials and Carriers (4) I, II. DeForest and Hollowell 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. Carnwath, Henderson & Hollowell Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 101 or consent of instructor. Advanced painting in various media including oil and polymers. May be repeated once for credit with consent of instructor.

103. Advanced Drawing (4) I. Carnwath Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2, 3, 4, 16, or consent of instructor. Advanced drawing, composition and form in black and white and color. May be repeated once for credit with consent of instructor.

104. Figure Drawing and Painting (4) I, III. Schulz and staff Laboratory—12 hours. Prerequisite: courses 4 and 101, or consent of instructor. Advanced figure drawing and painting using the human figure as subject. May be repeated once for credit with consent of instructor.

110. Photography I (4) I, II, III. Himelfarb & Puls Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Photography as an art form. Experiments with camera and light sensitive materials.

111. Photography II (4) II. Himelfarb Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. 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) II. The Staff Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Woodcut, linocut, metal-plate relief and experimental uses of other materials.

126. Printmaking: Intaglio (4) I, III. The Staff Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Metal plate etching, aquatint, hard- and soft-ground, burin engraving and related methods. May be repeated once for credit with consent of instructor.

127. Printmaking: Lithography (4) I. DeForest 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. 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. The Staff Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 142 or consent of instructor. Introduction to color, as well as glazing and use of kiln. May be repeated once for credit with consent of instructor.

***144. Sculpture: Figure Modeling (4)** II. 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: courses 141, 143, 144, or 145. Advanced form and color. Clay sculpture in relief and round. May be repeated once for credit with consent of instructor.

Group B: Theory and Criticism

147. Theory and Criticism of Photography (4) III. Himelfarb Lecture—3 hours; term paper. Prerequisite: course 2 or 5 and one art lecture course. Development of camera vision, ideas, and aesthetics and their relationship to the fine arts from 1839 to the present.

148. Theory and Criticism: Painting and Sculpture (4) II. Thiebaud

Lecture—3 hours; term paper. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

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. (PNP grading only.)

***193. Seminar in Art Practice (4)** II. The Staff (Chairperson in charge) Discussion-laboratory—8 hours; variable—4 hours. Prerequisite: courses 2 and 3; upper division status taking courses in upper division drawing, painting, and sculpture. Work (painting, sculpture, drawing, etc.) done for group discussion and criticism, as well as group discussion of contemporary topics in the visual arts. Offered in alternate years.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (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. Carnwath, Himelfarb, Rogoff and staff Seminar—3 hours. Original works produced for group discussion and criticism; associated topics of a contemporary and historical nature. May be repeated for credit.

291. Seminar: Critical Evaluation (1) II. The Staff (Graduate Adviser in charge) Seminar—1 hour. May be repeated for credit. (S/U grading only.)

292. Seminar: Comprehensive Qualifying (1) I. The Staff (Graduate Adviser in charge) Seminar—1 hour. Further critical evaluation of the student's work to determine his eligibility to begin the Comprehensive Project. May be repeated for credit. (S/U grading only.)

299. Individual Study (1-6) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Comprehensive Project (9) III. The Staff (Graduate Adviser in charge) An original body of work accompanied by a catalog summarizing the student's aesthetic position. May be repeated for credit. (S/U grading only.)

Professional Courses

***401. Museum Training: Curatorial Principles (4)** II. Amerson Seminar—3 hours; papers. Approved for graduate degree credit. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums.

402. Museum Training: Exhibition Methods (4) II. Amerson Seminar—3 hours; exhibition. Approved for graduate degree credit. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms.

Note: Various of the above courses are not offered each year; please check quarterly schedules.

Asian American Studies

(College of Letters and Science)
George Kagiwada, Ph.D., Program Director
Program Office, 156 AOB 4 (916-752-3625)

Committee in Charge

Vincent A. Crockenberg, Ph.D. (*Education*)
 Roy H. Doi, Ph.D. (*Biochemistry and Biophysics*)
 Isao Fujimoto, M.A. (*Applied Behavioral Sciences*)
 George Kagiwada, Ph.D. (*Asian American Studies*)
 Peter C.Y. Leung, M.S. (*Asian American Studies*)
 Vicki Ruiz, Ph. D. (*History*)
 Diane Wolf, Ph. D. (*Sociology*)

Faculty

George Kagiwada, Ph.D., Director
 Peter C.Y. Leung, M.S., Lecturer S.O.E.

Program of Study. Currently, Asian American Studies does not offer a major. A minor program, Asian American Studies, is available to students interested in this field of study.

American History and Institutions. This University requirement can be satisfied by one of the following courses in Asian American Studies: 1, 2. (See also under University requirements.)

Related Courses. For courses in Asian languages, see Cantonese (below) and Chinese and Japanese. For other Asian courses, see Chinese and Japanese, and East Asian Studies.

Minor Program Requirements:

UNITS

Asian American Studies20
 Asian American Studies 100, 1108
 An additional three courses from Asian American Studies 101, 111, 112, 130, 192 (No more than 4 units of 192 may be counted toward this total)12
Minor Adviser. P.C.Y. Leung

Courses in Asian American Studies

Direct questions pertaining to the following courses to the Instructor or to Asian American Studies Program, 156 AOB 4 (916-752-3625).

Lower Division Courses**1. Historical Experience of Asian Americans (4) I, II, III. The Staff**

Lecture—3 hours; discussion—1 hour. Introduction to Asian American Studies through an overview of the history of Asians in America from the 1840s to the present within the context of the development of the United States. (Offered fall and spring quarters in even-numbered years. Offered winter quarter in odd-numbered years.)

2. Contemporary Experience of Asian Americans (4) I, II, III. Kagiwada

Lecture—3 hours; discussion—1 hour. Introduction to Asian American Studies through analysis of relationships between ethnicity, race, and culture. Identity development of Asian Americans and their communities in the context of contemporary American institutional practices. (Offered winter quarter in even-numbered years. Offered fall and spring quarters in odd-numbered years.)

20. Calligraphic Expression in Asian American Culture (3) II. Leung

Lecture—2 hours; studio—3 hours. Survey the legacy of calligraphy in Asian American families, festivals, temples, and schools. Understanding and appreciation of calligraphy through some basic writing. Trace origins, principles and styles of Chinese and Japanese calligraphy. Offered in alternate years.

92. Internship (1-3) I, II, III. The Staff (Director in charge)

Internship—3-9 hours. Prerequisite: enrollment dependent on availability of intern positions and consent of instructor. Supervised internship in community and institutional settings related to Asian American concerns. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Primarily intended for lower division students. (P/NP grading only)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Director in charge)

(P/NP grading only.)

Upper Division Courses

100. Asian American Communities (4) II. Kagiwada
 Lecture/discussion—4 hours. Prerequisite: course 110. Study of historical and contemporary experiences of various Asian American groups, with the community as the unit of analysis.

101. Language and Educational Issues of Asian Immigrants (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2; upper division standing. Analysis of language diversity issues in American society, especially in public schools. Overview of public policies on language and programs, particularly for Asian language minority students. Offered in alternate years.

110. Theoretical Perspectives in Asian American Studies (4) I. Kagiwada

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; upper division standing. Theories of race and ethnic relations as tools for understanding the Asian American experience with the society as the unit of analysis.

111. Ethnic Self and Identity (4) III. Kagiwada

Lecture/discussion—4 hours. Prerequisite: course 101. Study of cultural and social psychological influences on Asian Americans, with the individual as the unit of analysis.

112. Asian/Pacific American Women (4) II. The Staff

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; upper division standing. Examination of the cultural, social, and political situation of Asian and Pacific American women using theoretical perspectives from social science disciplines: socialization, family dynamics, domestic and political power, economic production, and division of labor.

130. Asian American Culture Through Literature (4) III. The Staff

Lecture/discussion—4 hours. Prerequisite: course 1 or 2; upper division standing. Analysis of Asian American writings as expressions of various cultural themes, psychological issues, interpersonal relationships and sociopolitical influences on the Asian American experience. Consideration of metaphor, autobiographic elements, plot, protagonist-antagonist relationships, and other literary elements.

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 (1-5) I, II, III. The Staff (Director in charge)

Internship—3-15 hours. Prerequisite: enrollment dependent on availability of intern position with priority to Asian American Studies minors. Supervised internship in community and institutional settings related to Asian American concerns. (P/NP grading only.)

197T. Tutoring in Asian American Studies (1-5) I, II, III. The Staff (Director in charge)

Tutoring—1-5 hours. Prerequisite: upper division standing and completion of appropriate course with distinction; consent of instructor. Tutoring in lower division Asian American Studies courses in small group discussion. Weekly meetings with instructor. May be repeated for credit once for a given course and also for a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. Primarily intended for upper division students. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Courses in Cantonese**Lower Division Courses**

1-2-3. Elementary Cantonese (5-5-5) I-II-III. Leung
 Lecture—3 hours; recitation—3 hours. Introduction to Cantonese grammar and development of conversational skills in a cultural context. Approximately 250 Chinese characters will be introduced during Cantonese 2 and 3. (Not open to native speakers.)

4-5-6. Intermediate Cantonese (3-3-3) I-II-III. Leung
 Lecture—2 hours; recitation—2 hours. Prerequisite: course 1-2-3 or the equivalent. Development of conversational skills in a cultural context. Community-oriented language materials in health care, social service, and bilingual education will be introduced.

Asian Studies

See Asian American Studies;
 and East Asian Studies

Astronomy

See Physics

Atmospheric Science

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Land, Air and Water Resources.

The Major Program

Atmospheric science is the study of the 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.

The Program. Atmospheric science is based on applied mathematical physics, and is strongly relevant to environmental biology and human ecology. The course of study provides a mathematical and physical science background. In addition to a broad background in meteorology, the major includes a minor area to be chosen from mathematics, computer science, environmental studies, resource management or a physical or biological science.

Internships and Career Alternatives. Atmospheric science students have participated in internships with the California Air Resources Board, various county Air Pollution Control Districts, and the National Weather Service. Numerous career opportunities exist in the federal and state governments, research and development in the private sector, and education. Examples of career areas are agricultural meteorology, air-pollution forecasting and control, weather modification, hurricane and severe weather forecasting and research, weather satellite meteorology, and numerical weather forecasting. About half of our graduates continue their education by seeking the M.S. or Ph.D. degrees in atmospheric science.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	63
Biological sciences (Biological Sciences 1A, 1B).....	10
Chemistry (Chemistry 1A, 1B).....	10
Computer science (Engineering 5 or the equivalent in FORTRAN programming).....	3
Mathematics (Mathematics 21A, 21B, 21C, 22A, 22B, 22C).....	21
Meteorology (Atmospheric Science 60).....	4
Physics (Physics 9A, 9B, 9C).....	12
Statistics (Statistics 32).....	3
Breadth/General Education	28
Satisfaction of General Education requirement.....	6-16
Additional units in social sciences and humanities to total 28 units	
Depth Subject Matter	30
Atmospheric Science 110A, 110B, 120, 121A, and 121B.....	18
Upper division Atmospheric Science courses selected with adviser's approval... 12	
If both courses 105 and 133 are taken, only 4 units may be counted. No more than 3 units of courses 192 and 199 may be counted.	
Restricted 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	30-38
Total Units for the Degree	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 (916-752-1669).

Graduate Study. You can specialize in particular areas of atmospheric science through graduate study and research leading to the M.S. and Ph.D. degrees. For details see under the Graduate Group in Atmospheric Science. See also the Graduate Division section in this catalog.

Related Courses. See 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 (916-752-1669).

Lower Division Courses

10. Severe and Unusual Weather (3) I. The Staff; III. Carroll, Weare

Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10, high school physics or the equivalent. Extreme or unusual weather events, e.g., floods, blizzards, hurricanes, tornadoes and desertification. Emphasis placed on scientific perspective and human context. Not intended for students majoring in the physical sciences. General Education credit:

Nature and Environment/Non-Introductory. Recommended GE preparation: Physics 10.

60. Introduction to Atmospheric Science (4) I. Shaw

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21C and Physics 9A. 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)

Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Internship off and on campus in atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

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. Offered in alternate years.

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 (5) I. The Staff

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 110A, knowledge of FORTRAN (Engineering 5). Application of dynamic theory to weather systems. Special emphasis on remote sensing of weather variables, numerical weather prediction, satellite meteorology and tropical meteorology. Laboratory emphasis on the analysis and forecasting of current weather situations.

120. Atmospheric Thermodynamics and Statics (3) I. Weare

Lecture—3 hours. Prerequisite: Mathematics 22C; Physics 9A; 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. Nathan
Lecture—3 hours. Prerequisite: course 120; Mathematics 22C; Physics 9B. The atmosphere in motion: equations of motion for rotating atmospheres; pressure and density fields and their relations to atmospheric circulations; wave motion in the atmosphere; vorticity. The physical basis of modern numerical methods in meteorology.

121B. Atmospheric Dynamics (3) III. Nathan
Lecture—3 hours. Prerequisite: course 121A. The dynamics of fluid motion in geophysical and laboratory systems: Rossby waves; Helmholtz waves; the effect of turbulence; boundary layers; the Ekman layer. The dynamics of convective motion: the Rayleigh problem; penetrative convection; convective plumes; cumulus models.

124. Meteorological Instruments and Observations (3) I. Paw U

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 60; Physics 9C. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included. Offered in alternate years.

128. Radiation and Satellite Meteorology (4) II. Weare

Lecture/discussion—3 hours; discussion/laboratory—1 hour. Prerequisite: course 60; Physics 9B; 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 cloudiness.

133. Biometeorology (4) II. Paw U

Lecture—3 hours; discussion—1 hour. Prerequisite: two courses in a biological discipline; Mathematics 16B. Atmospheric and biological interactions. Physical basis for plant, animal and human response and adaptation to short-term and long-term meteorological events. Students who have completed course 105 may receive only two units of credit.

149. Introduction to Air Pollution (3) I. Carroll, Chang, 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 on geophysical processes and air pollution meteorology as well as physical and chemical properties of pollutants. (Same course as Civil Engineering 149.)

150. Numerical Weather Prediction (4) II. Grotjahn

Lecture—3 hours; discussion—1 hour. Prerequisite: course 121B and Engineering 5. Numerical techniques and their applications to meteorological problems. Finite differencing and spectral methods, design of forecast models, parameterization of physical processes and predictability. Written computer programs to illustrate these topics.

158. Boundary-Layer Meteorology (4) III. Shaw
Lecture—3 hours; discussion—1 hour. Prerequisite: course 121A. Growth, development and structure of the atmospheric layer directly influenced by the underlying surface and extending to a maximum of about two kilometers under convective conditions. Turbulent diffusion in the boundary layer. The microclimate at and near the ground surface.

192. Atmospheric Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Internship off and on campus in atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: three upper division units in Atmospheric Science. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: three upper division units in Atmospheric Science and at least an overall B average. (P/NP grading only.)

Graduate Courses

200. Atmospheric Processes (3) I. The Staff
Lecture—3 hours. Prerequisite: Mathematics 22B-22C; Physics 9B. Advanced phenomenological and physical study of atmospheric structure and processes including radiation, statics, thermal structure and weather phenomena. Accelerated presentation of the major topics covered in courses 60, 110A-110B, 120, and 128. Credit not allowed to students having completed any two of these courses.

***221A. Advanced Atmospheric Dynamics I** (3) II. Nathan

Lecture—3 hours. Prerequisite: course 121B. Shallow water theory and potential vorticity conservation. Mathematical and physical properties of geophysical

waves. Wave-wave interactions. Barotropic instability of geophysical flows. Offered in alternate years.

***221B. Advanced Atmospheric Dynamics II (3) III.** Nathan

Lecture—3 hours. Prerequisite: course 221A. Quasi-geostrophic potential vorticity equation for a rotating stratified atmosphere on a sphere. Conditions for instability in stratified atmospheres; baroclinic instability. Wave-zonal flow interaction theory. Forced waves in the atmosphere. Nonlinear theory of baroclinic instability. Offered in alternate years.

223. Advanced Boundary-Layer Meteorology (3) III. Shaw

Lecture—3 hours. Prerequisite: course 230. Characteristics of the atmospheric boundary layer under convective and nocturnal conditions. Heat budget at the surface and boundary layer forcing. Similarity theory and scaling of the boundary layer. Measurement and simulation techniques. Offered in alternate years.

230. Atmospheric Turbulence (3) 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 alternate years.

231. Advanced Air Pollution Meteorology (3) II. Carroll

Lecture—3 hours. Prerequisite: course 149, and one course in fluid dynamics. Processes determining transport and diffusion of primary and secondary pollutants. Models of turbulence, of the atmospheric boundary layer and of mesoscale wind fields, as applicable to pollutant dispersion problems are examined. Offered in alternate years.

233. Topics in Advanced Biometeorology (3) II. Paw U

Lecture—2 hours; discussion—1 hour. Prerequisite: course 133 or consent of instructor. Study of current topics in biometeorology focusing on interactions of plants with the weather. Biological energy budgets and adaptations to changes in energy regime. Quantification of weather parameters for optimum biological response. Offered in alternate years.

240. General Circulation of the Atmosphere (3) I. Grotjahn

Lecture—3 hours. Prerequisite: course 121B. Large-scale, observed atmospheric circulations. Energy and momentum balances derived and compared with observations. Theoretical framework developed to synthesize observed features. Offered in alternate years.

241. Climate Dynamics ((3) 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 alternate 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 alternate years.

255. Numerical Modeling of the Atmosphere (4) II. Grotjahn and Soong

Lecture—2 hours; laboratory—6 hours. Principles of numerical modeling of the dynamic, thermodynamic and physical processes of the atmosphere. Hands-on experiments on model development using the shallow water equations and the primitive equations. Operational forecast models. Offered in alternate years.

270A-G. Topics in Atmospheric Science (1-3) I, II, III. The Staff

Discussion—1-3 hours. Applications and concepts in (A) Meteorological Statistics; (B) Computer Modeling of the Atmosphere; (C) Design of Experiments and Field Studies in Meteorology; (D) Solar and Infrared Radiation in the Atmosphere; (E) Aerosol and Cloud Physics; (F) Atmospheric Chemistry; (G) General Meteorology.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: graduate standing in Atmospheric Science or related field. Current developments in selected areas of atmospheric research. Topics will vary according to student and faculty interests. (S/U grading only.)

291A-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)

Richard D. Grotjahn, Ph.D., Chairperson of the Group (916-752-2246)

Group Office, 151 Hoagland Hall (916-752-1406)

Faculty. Includes nineteen faculty members from the Departments of Land, Air and Water Resources, Mechanical Engineering, Civil Engineering, Geography, Physics, the Laboratory for Energy-Related Health Research, the Division of Environmental Studies, and the National Institute for Global Environmental Change.

Graduate Study. The Graduate Group in Atmospheric Science offers both the M.S. and Ph.D. degree programs. The student can place major emphasis on graduate work in one or more of the following fields: air quality meteorology, biometeorology, micrometeorology, numerical weather prediction, climate dynamics, large scale dynamics, and mesoscale meteorology. The diverse and extensive backgrounds of the faculty allow opportunities for interdisciplinary training and research.

Preparation. The Group encourages applications from all interested students with backgrounds in the physical or natural sciences. Basic qualifications for students entering the Atmospheric Science graduate program include mathematics to the level of vector calculus and differential equations, and one year of college-level physics. Considerable flexibility may be allowed for students with high academic potential, but it is expected that deficiencies in preparatory material and in key undergraduate atmospheric science courses be completed within the first year of graduate study.

Graduate Adviser. S.T. Soong (*Land, Air and Water Resources, 752-6151*).

Graduate Admissions Officer. T.R. Nathan (*Land, Air and Water Resources, 752-1609*).

Avian Medicine

See Epidemiology and Preventive Medicine

*Course not offered this academic year.

Avian Sciences

(College of Agricultural and Environmental Sciences)

_____, Ph.D., Chairperson of the Department

Department Office, 3202 Meyer Hall (916-752-1300)

Faculty

Ursula K. Abbott, Ph.D., Professor
Hans Abplanalp, Ph.D., Professor Emeritus
Francine A. Bradley, Ph.D., Lecturer
Ralph A. Ernst, Ph.D., Lecturer
C. Richard Grau, Ph.D., Professor Emeritus
Annie J. King, Ph.D., Associate Professor
Kirk C. Klasing, Ph.D., Associate Professor
F. Howard Kratzer, Ph.D., Professor Emeritus
James R. Millam, Ph.D., Associate Professor
Frank X. Ogasawara, Ph.D., Professor Emeritus
Kathryn Radke, Ph.D., Assistant Professor
Pran N. Vohra, Ph.D., Professor Emeritus
Wesley W. Weathers, Ph.D., Professor
Barry W. Wilson, Ph.D., Professor
Wilbor O. Wilson, Ph.D., Professor Emeritus
Allen E. Woodward, M.S., Lecturer Emeritus

The Major Program

Avian sciences is the study of birds and the ways in which they relate to and are useful to humans. The major combines the study of avian wildlife and their environments, production and marketing of domestic birds and eggs, caged exotic bird management, and basic and applied laboratory research on birds with a broad introduction to biological science.

The Program. The flexibility of the program and the close personal interaction between students, faculty, and specialists in the field give students a large role in selecting and designing their own course work. Students may specialize in a bachelor's program that qualifies them for a particular career or they may choose a program to meet other broader intellectual and cultural interests.

Internships and Career Alternatives. Independent study, undergraduate research, and internships are features emphasized in the avian sciences program. There are birds available for laboratory or special study housed within the main building as well as at the research farm and the experimental aviary. A student in the avian sciences major has a variety of career options: health-oriented research, teaching biology, gamebird production, domestic and foreign agricultural extension and advisory services, governmental agencies, or the domestic or exotic bird industries. A recent survey has shown that the majority of avian sciences graduates enter graduate school or are employed by the domestic bird industry. The remainder of the graduates were evenly distributed in the categories of professional schools, avian biology agencies, educational fields, and individual jobs indirectly associated with birds.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable.)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	53-54
Avian sciences (Avian Sciences 11 or 13).....	3-4
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Computer science (Agricultural Science and Management 21).....	3
Mathematics (Mathematics 16A, 16B).....	6
Physics (Physics 1A and 1B).....	6
Statistics (Statistics 13)	4

Breadth Subject Matter	24
Satisfaction of General Education requirement	24
Depth Subject Matter	49
Physical 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, or Physiology 110L)	
Specialized courses related to avian species	25
Restricted Electives	27
To supplement or expand depth subject matter courses	
Unrestricted Electives	18-20
Total Units for the Degree	180

Major Adviser. A.J. King.

Advising Center for the major is located in 3202 Meyer Hall (916-752-1300).

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; Zoology 100, 100L.

Courses in Avian Sciences

Lower Division Courses

11. Introduction to Poultry Science (3) II. Bradley Lecture—3 hours. The mosaic of events that have tied poultry science to other scientific disciplines and poultry to humans. Poultry science techniques and production methods from the time of domestication to the present. One field trip required. General Education credit: Nature and Environment/Introductory.

11L. Laboratory in Avian Sciences (1) II. Morzenti Laboratory—3 hours. Prerequisite: course 11 (may be taken concurrently). Demonstrations, laboratory exercises and two Saturday field trips; management, anatomy, reproduction, egg incubation, nutrition, health and welfare of domestic birds; data collection techniques.

13. Birds, Humans, and the Environment (4) III.

Wilson

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 preparation: Biological Sciences 10.

92. Internship in the Avian Sciences (1-12) I, II, III.

The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: sophomore standing preferred; consent of instructor. Internship on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Problems in avian biology; nutrition, breeding, and physiology of poultry/wild birds and their products. (P/NP grading only.)

Upper Division Courses

100. Principles of Avian Sciences (5) II. The Staff

Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A. Aspects of biology (anatomy, physiology, behavior, nutrition, reproduction and genetics) that govern the life of birds. Emphasis on those features of birds, domestic, wild and experimental, which are distinctive.

101. Patterns in Avian Biology (3) I. Weathers

Lecture—3 hours. Prerequisite: Biological Sciences 1B or the equivalent. Patterns of reproduction, locomotion, foraging, growth and development, energetics, and temperature regulation exhibited by birds. Ecological and evolutionary adaptations and allometric analysis of life history traits.

102. Fertility and Hatchability (4) III. Abbott

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100; Genetics 100; Zoology 100. Normal avian embryonic development. Reproductive failures resulting from disease, nutritional or genetic causes. Use of avian embryos in biomedical research.

115. Raptor Biology (3) I. Morzenti

Lecture—3 hours. Prerequisite: Biological Sciences 1A or the equivalent. Study of birds of prey: classification, distribution, habits and habitats, migration, unique anatomical and physiological adaptations, natural and captive breeding, health and diseases, environmental concerns, conservation, legal considerations, rehabilitation, and falconry. Includes two Saturday field trips.

123. Management of Birds (4) III. Millam

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100. Captive management of birds will be studied by focusing on four major avian groups: ducks, parrots, pheasants, and pigeons. Management practices will be studied in relation to differences in avian physiology and human culture.

***130. Poultry Breeding and Genetics (3) I.**

Abplanalp

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100. Applications of genetic principles in poultry. Action of major genes in the control of morphology, reproduction and disease resistance. Breeding plans and genetic tests for major genes as well as traits with quantitative inheritance.

149. Advanced Poultry Management (4) III. Ernst

Lecture—3 hours; discussion—1 hour. Prerequisite: course 11 or Animal Science 2, or the equivalent. Environmental management of poultry: brooding; disease prevention; recycling; lighting programs; housing design; egg, broiler, and turkey production; breeding flock care; and hatchery management. Offered in alternate years.

150. Nutrition of Birds (1) III. Klasing

Lecture—1 hour. Prerequisite: Nutrition 110 (may be taken concurrently). Principles of nutrition specific to avian species, including feedstuffs, feed additives, nutrient metabolism, energy systems, and nutritional support of egg production and growth. Use of computers for feed formulation to support production. Offered in alternate years.

150L. Nutrition of Birds Laboratory (2) III. King

Laboratory—6 hours. Prerequisite: course 150. Feeding trials to show nutrient requirements. Metabolizable energy study and proximate analysis of feed. Determination of vitamins, minerals, fatty acids and other nutrients or substances in feed with emphasis on use of laboratory equipment.

190. Seminar in Avian Sciences (1) I, II, III. 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)

Internship—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Internship on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

195. Topics in Current Research (1-3) I, II, III. The Staff (Chairperson in charge)

Lecture-discussion—variable. Hours will depend on instructor with the number of units being commensurate with time in class. Prerequisite: consent of instructor. Discussion of topics of current interest in avian sciences. May be repeated three times for credit.

197T. Tutoring in Avian Sciences (1-3) I, II, III. The Staff (Chairperson in charge)

Hours and duties vary depending upon course being tutored. Prerequisite: Avian Sciences or related major; advanced standing; consent of instructor. Tutoring of students in lower division avian sciences courses; weekly conference with instructors in charge of course; written critiques of teaching procedures. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

220. Cellular Proliferation and Oncogenes (4) 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: course work in endocrinology, avian biology or reproductive physiology. Examination of current issues in avian endocrinology with emphasis on endocrine aspects of reproductive physiology. Offered in alternate years.

250. Advanced Poultry Nutrition (3) III. Klasing

Lecture—2 hours; discussion—1 hour. Prerequisite: Nutrition 110. Metabolic basis for nutrient requirements in avian species including energy, amino acids, vitamins, and minerals. Discussions on design and analysis of nutrition trials, hormonal control of metabolism, nutritional and metabolic control of nutrient partitioning and gene expression. Offered in alternate years.

***260. Topics in Avian Physiological Ecology (2) I.**

Weathers

Lecture—1 hour; seminar—1 hour. Prerequisite: course 100; Physiology 110 or Physiological Sciences 101A-101B; senior or graduate standing. Energy and water requirements of captive and free-living birds. Metabolic requirements for growth, maintenance, reproduction, and thermoregulation. Emphasis given to diversity of patterns found in birds and their ecological correlates. Offered in alternate years.

290. Seminar (1) I, II, III. 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)

Tutoring—1-4 hours. Prerequisite: graduate standing and consent of instructor. Tutoring of students in lower, upper division, and graduate courses in Avian Sciences; weekly conference with instructor in charge of course; written critiques of teaching methods in lectures and laboratories. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Avian Sciences (A Graduate Group)

Hans Abplanalp, Ph.D., Chairperson of the Group
Group Office, 3202 Meyer Hall (916-752-1300)

Faculty. Consists of members from several departments in the College of Agricultural and Environmental Sciences and the School of Veterinary Medicine.

Graduate Study. The Graduate Group in Avian Sciences offers the M.S. degree program to students who wish to pursue specialized advanced work on avian species. The areas of specialization that may be chosen by the student at present include: nutrition, physiology, reproduction, pathology, toxicology, food chemistry, management, ecology, genetics, comparative incubation, environmental physiology, and cellular and developmental studies using wild and domestic birds as experimental animals. Both master's degree plans, thesis or comprehensive examination, are available.

Preparation. It is expected that the student will have had undergraduate preparation in a field appropriate to the course of study selected. The student will be expected to have had courses in most of the following subjects: general biology, general and organic chemistry, biochemistry, avian biology, genetics, nutrition, physiology, and statistics.

Graduate Adviser. K.C. Klasing (*Avian Sciences*).

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. Students who enjoy both chemistry and biology and who are comfortable with quantitative approaches to problem solving will find biochemistry a rewarding field of study.

The Program. The biochemistry program begins with a two-quarter general biochemistry course that provides an introduction to the principles of biochemistry. Biochemistry majors then take a comprehensive and rigorous laboratory course designed to familiarize them with the most important aspects of biochemical research. There are additional upper-division courses in biochemistry which examine detailed aspects of modern biochemistry. Students also are required to take courses in other biological sciences and a full year of physical chemistry.

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. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

Students majoring in Biochemistry in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry department to cover substantially the same material as upper division courses in the subject at UC Davis. Students in the College of Agricultural and Environmental Sciences must accumulate 54 units of upper division courses to graduate. Further information can be obtained from the Division of Biological Sciences Office, 376 Mrak Hall.

Career Alternatives. The biochemistry program provides a solid scientific background for students seeking a research, teaching, or service career in the life sciences. There are positions open to biochemists in the food processing, pharmaceutical, agricultural research, and chemical industries. Also, university-affiliated research laboratories, hospital laboratories, and government-sponsored research facilities provide employment opportunities.

B.S. Major Requirements:

	UNITS
English Composition Requirement	0-8
College of Agricultural and Environmental Sciences students only; See College requirement	
Preparatory Subject Matter	55-62
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (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 (Mathematics 16A-16B-16C or 21A-21B-21C).....	9-12
Physics, 12 units minimum (Physics 5A-5B-5C or 9A-9B-9C)†.....	12
Statistics (Statistics 13, 102, or 130A).....	4
Depth Subject Matter	38-39
Biochemistry 101A-101B, 101L.....	13
Genetics 100.....	4
Organic chemistry: Chemistry 118A-118B-118C or 128A-128B-128C, 129A-129B.....	12-13
Physical chemistry: Chemistry 107A-107B-108 or 110A-110B-110C.....	9
Breadth/General Education	24
<i>College of Letters and Science students:</i> Refer to the College section for a description of the options available in meeting this requirement.	
Restricted Electives	12
To include Biochemistry 133, 143, and 153; and at least one additional upper division course in biochemistry, another biological science, or chemistry.	
Unrestricted Electives to bring total to 180 units	
Total Units for the Major	180

Major Adviser. L.R. Sprechman (*Biochemistry and Biophysics*), 126 Briggs Hall.

Advising Center for the major is located in 156 Briggs (916-752-9032).

Graduate Study. See Biochemistry and Molecular Biology (A Graduate Group); and the Graduate Division section in this catalog.

Courses. See under Biochemistry and Biophysics.

†Physics 9D is optional. Students electing the Physics 9 sequence should elect Mathematics 21A-21B-21C and 22A-22B-22C.

Biochemistry and Biophysics

(College of Agricultural and Environmental Sciences)

Mark G. McNamee, Ph.D., Chairperson of the Department

Department Office, 149 Briggs Hall (916-752-3611)

Faculty

Judy Callis, Ph.D., Assistant Professor
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
Marlynn E. Etzler, Ph.D., Professor
Charles S. Gasser, Ph.D., Assistant Professor
Jerry L. Hedrick, Ph.D., Professor
Leonard M. Hjelmeland, Ph.D., Associate Professor
Lloyd L. Ingraham, Ph.D., Professor Emeritus
J. Clark Lagarias, Ph.D., Associate Professor
R. Marc Learned, Ph.D., Assistant Professor
Mark G. McNamee, Ph.D., Professor
Irwin H. Segel, Ph.D., Professor
Larry R. Sprechman, Ph.D., Lecturer, S.O.E.
Paul K. Stumpf, Ph.D., Professor Emeritus
Merna R. Villarejo, Ph.D., Professor

Major Programs and Graduate Study. See the major in Biochemistry and for graduate study see Biochemistry and Molecular Biology (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 (4) I, II, III. Gasser, Hilt, McNamee, Criddle, Etzler, Sprechman, Hjelmeland
Lecture—4 hours. Prerequisite: Chemistry 8B or 128B. Introduction to the chemistry of biologically important compounds such as proteins, nucleic acids, lipids and carbohydrates, with emphasis on their structure and function and the means to study them.

101B. General Biochemistry (3) I, II, III. Callis, Carlson, Conn, Segel, Sprechman
Lecture—3 hours. Prerequisite: course 101A. Continuation of course 101A: the major metabolic pathways of the cell; synthesis and breakdown of sugars, amino acids, nucleic acids and other metabolites and the bioenergetics involved; the control and integration of metabolism.

101L. General Biochemistry Laboratory (6) I, II, III. Chaykin, Hedrick, Hilt, Lagarias, McNamee, Sprechman
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) III. Callis, Conn, Lagarias
Lecture—3 hours. Prerequisite: course 101B. The chemistry of important plant constituents and pro-

cesses such as photosynthesis and respiration; carbohydrate, fat, and nitrogen metabolism.

123. An Introduction to Enzymology (3) III. Whitaker (Food Science and Technology)

Lecture—3 hours. Prerequisite: course 101B. Principles of physical, chemical and catalytic properties of enzymes and their utilization. Experimental determination and quantitative evaluation of influence of reaction conditions on activity are stressed. Specificity and mechanism of action illustrated by consideration of selected enzymes.

123L. Enzymology Laboratory (2) III. Whitaker (Food Science and Technology)

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in separation and study of enzymes.

133. Behavior and Analysis of Enzyme Systems (3) III. Segel

Lecture—3 hours. Prerequisite: 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, 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)

Internship—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.)

Graduate Courses

201A. Physical and Chemical Biochemistry (4) I. Benisek (Biological Chemistry), Criddle, Lagarias, Matthews (Biological Chemistry), Segel, 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) I. Learned

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 alternate years.

201C. Molecular Biology (3) III. Bradbury (Biological Chemistry), Dahmus, Doi, Hershey (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) II. Etzler, McNamee, Traut (Biological Chemistry), Troy (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) II. Carlson, Hedrick
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. May be repeated twice for credit.

***204. Gene Expression** (3) III. The Staff
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.

***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 alternate 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 alternate years.

***215. Kinetics of Biological Systems** (2) III. The Staff

Lecture—2 hours. Prerequisite: courses 201A, 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 alternate years.

250. Biochemical Literature (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 201C or con-

sent 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 teaching biochemistry. Includes analyses 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.)

Biochemistry and Molecular Biology (A Graduate Group)

Harry R. Matthews, Ph.D., Chairperson of the Group
Group Office, 149 Briggs Hall (916-752-9031)

Faculty. Consists of members from the Colleges of Letters and Science, and Agricultural and Environmental Sciences, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Biochemistry and Molecular Biology offers programs of study and research leading to the M.S. and Ph.D. degrees. Graduate work in biochemistry involves a broad overview plus specialization in one or more of the following: protein chemistry, control of gene expression, plasmids, gene rearrangements, chromosome structure and function, immunochemistry, molecular virology, reproductive biochemistry, structure and function of surfaces, protein synthesis, biochemistry of neoplasia, biochemistry of chloroplasts, lipid biosynthesis, hormonal control of metabolism, photobiology, enzymology, and membrane transport. For detailed information regarding graduate study, address the chairperson of the group.

Graduate Advisers. E. Bandman (*Food Science and Technology*), L. F. Bisson (*Viticulture and Enology*), J.C. Lagarias (*Biochemistry and Biophysics*), M.R. Villarejo (*Biochemistry and Biophysics*).

Courses in Biochemistry and Molecular Biology

Graduate Courses

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Biological Chemistry

See Medicine, School of

Biological Sciences

(Intercollege Division)

Robert D. Grey, Ph.D., Dean of Biological Sciences

Merna R. Villarejo, Ph.D., Associate Dean

Division Office, 376 Mrak Hall (916-752-0410)

Faculty

Faculty includes all members of the 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.

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

Biological sciences is the study of life from the molecular level up to the level of populations. New discoveries continually add to and change this dynamic field.

The Program. The biological sciences major programs (Bachelor of Arts and Bachelor of Science) are good choices for students who want to obtain a broad knowledge of biology. The core program for both degrees includes mathematics, both general and organic chemistry, and courses in biology which stress the unity of life as well as its diversity. The Bachelor of Science program focuses on the natural sciences and is intended for students who are interested in laboratory or research careers. The Bachelor of Arts program requires fewer units in the natural sciences allowing students to take more courses in the humanities and social sciences. It is a good choice for students who wish to pursue a "people-oriented" career.

Choice of College. The Bachelor of Arts degree is offered only by the College of Letters and Science. The Bachelor of Science degree is offered by both the College of Letters and Science and the College of Agricultural and Environmental Sciences. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

Career Alternatives. The biological sciences degree provides suitable preparation for a wide variety of careers, including teaching, biological research, work with various governmental agencies or with private companies, and all the health sciences. It is also an excellent background for students wishing to enter a graduate program in biology, a teacher-training program, a health professional school, or other professional schools.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	37-43

Biological Sciences 1A-1B-1C	15
Chemistry 1A-1B	10
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics and/or statistics	6
Recommended: Chemistry 1C; Physics 5A, 5B, 5C; a course in computer programming.	

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) <i>Organismal biology:</i> Botany 102, 105, 108, 114, 118, 119; Entomology 101, 102, 103; Microbiology 105, 162; Veterinary Microbiology 127, 128; Wildlife and Fisheries Biology 111, 120; Zoology 100, 105, 106, 112, 133, 134, 136, 137.
(b) <i>Population biology and ecology:</i> Anthropology 154A; Botany 117, 144; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 150C; Microbiology 120; Wildlife and Fisheries Biology 110, 151; Zoology 125.
(c) <i>Evolutionary biology:</i> Anthropology 151, 152; Botany 100, 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
(d) <i>Physiology:</i> Botany 111, 112; Microbiology 130A-130B; Physiology 110, 117; Plant Pathology 130; Zoology 142, 143.
(e) <i>Biochemistry and cell biology:</i> Biochemistry 122, 123, 133, 143, 153; Botany 125; Botany/Zoology 130; Genetics 102A; Medical Microbiology 107; Physiology 100A-100B; Veterinary Microbiology 126; Zoology 121A, 121B, 121C.

Note: Biological Sciences 121 may be used to satisfy either Group D or Group E.

Total Units for the Major	73-79
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Breadth Subject Matter
<i>College of Letters and Science students:</i>
Refer to the College section for a description of requirements to be completed in addition to the major.

B.S. Major Requirements:	UNITS
Preparatory Subject Matter	61-67
Biological Sciences 1A-1B-1C	15
Chemistry 1A-1B-1C or 4A-4B-4C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B-16C	9
Physics 5A-5B-5C	12
Statistics 13 or 102	4
Recommended: Chemistry 5, a course in computer programming.	

Depth Subject Matter	45
Biochemistry 101A-101B or Physiological Sciences 101A-101B	7
Genetics 100	4
Restricted Electives	34

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 Requirements: 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.

Course List for Group Requirement
(a) <i>Organismal biology:</i> Botany 102, 105, 108, 114, 118, 119; Entomology 101, 102, 103; Microbiology 105, 162; Veterinary Microbiology 127, 128; Wildlife and Fisheries Biology 111, 120; Zoology 100, 105, 106, 112, 133, 134, 136, 137.
(b) <i>Population biology and ecology:</i> Anthropology 154A; Botany 117, 144; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 150C; Microbiology 120; Wildlife and Fisheries Biology 110, 151; Zoology 125.
(c) <i>Evolutionary biology:</i> Anthropology 151, 152; Botany 100, 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
(d) <i>Physiology:</i> Botany 111, 112; Microbiology 130A-130B; Physiology 110, 117; Plant Pathology 130; Zoology 142, 143.
(e) <i>Biochemistry and cell biology:</i> Biochemistry 101A-101B; Botany/Zoology 130; Physiological Sciences 101A-101B; Physiology 100A-100B.

Total Units for the Major	73-79
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Breadth Subject Matter
<i>College of Letters and Science students:</i>
Refer to the College section for a description of requirements to be completed in addition to the major.

B.S. Major Requirements:	UNITS
Preparatory Subject Matter	61-67
Biological Sciences 1A-1B-1C	15
Chemistry 1A-1B-1C or 4A-4B-4C	15
Chemistry 8A-8B or 118A-118B-118C	6-12
Mathematics 16A-16B-16C	9
Physics 5A-5B-5C	12
Statistics 13 or 102	4
Recommended: Chemistry 5, a course in computer programming.	

Depth Subject Matter	45
Biochemistry 101A-101B or Physiological Sciences 101A-101B	7
Genetics 100	4
Restricted Electives	34

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 Requirements: 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.

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) <i>Organismal biology:</i> Botany 102, 105, 108, 114, 118, 119; Entomology 101, 102, 103; Microbiology 105, 162; Veterinary Microbiology 127, 128; Wildlife and Fisheries Biology 111, 120; Zoology 100, 105, 106, 112, 133, 134, 136, 137.
(b) <i>Population biology and ecology:</i> Anthropology 154A; Botany 117, 144; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 150C; Microbiology 120; Wildlife and Fisheries Biology 110, 151; Zoology 125.
(c) <i>Evolutionary biology:</i> Anthropology 151, 152; Botany 100, 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
(d) <i>Physiology:</i> Biological Sciences 121, Botany 111, 112; Microbiology 130A-130B; Physiology 110, 117; Plant Pathology 130; Zoology 142, 143.
(e) <i>Biochemistry and cell biology:</i> Biochemistry 122, 123, 133, 143, 153; Botany 125; Botany/Zoology 130; Genetics 102A; Medical Microbiology 107; Physiology 100A-100B; Veterinary Microbiology 126; Zoology 121A, 121B, 121C.

Note: Biological Sciences 121 may be used to satisfy either Group D or Group E.

Total Units for the Major	106-112
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Breadth Subject Matter
<i>Written/Oral Expression</i>
See appropriate College section for requirement
<i>Breadth/General Education</i>
Satisfaction of General Education requirement

See also the appropriate College section for additional requirements

Course List for Area Requirement
(a) <i>Animal biology:</i> Anatomy 100; Anthropology 151, 152, 153, 154A, 155, 156; Avian Sciences 100; Biological Sciences 120; Entomology 101, 102, 103, 104, 106, 109, 116, 119, 153; Environmental Studies 129; Geology 111A; Cell Biology and Human Anatomy 101; Nematology 110; Wildlife and Fisheries Biology 110, 111, 120, 140, 151; Zoology 100, 105, 106, 112, 125, 133, 134, 136, 137, 138, 139, 147, 148, 149, 155.
(b) <i>Microbiology:</i> Botany 114, 118, 119; Entomology 156; Geology 111B; Medical Microbiology 107; Microbiology—all upper division courses (excluding 190-199 courses); Plant Pathology 120, 130; Veterinary Microbiology 126, 127, 128, 132.
(c) <i>Plant Biology:</i> Botany 100, 101, 102, 105, 108, 111, 112, 114, 116, 117, 118, 119, 121, 122, 140, 144; 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).

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-

*Course not offered this academic year.

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 High and Highest Honors at graduation. 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/or microbiology, and in four of the following five subdisciplines: organismal biology, ecology, evolution, physiology, and/or 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 1004
Additional upper division units (see Area and Group Requirements below).....18

Area Requirements:

One course in two of three areas: Animal Biology, Microbiology, and/or 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*: Botany 102, 105, 114; Microbiology 105; 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 111, 112; 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 (BML) 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, with students housed on the Laboratory grounds. Participants are assessed a room and board fee in addition to standard campus registration fees.

Application required. Forms can be obtained from the Division of Biological Sciences. Applications due on or before pre-registration deadline. Additional information on the Bodega Marine Laboratory Program is available from the Division Office or BML directly, (707) 875-2211, P.O. Box 247, Bodega Bay, CA 94923.

Courses in Biological Sciences

Lower Division Courses

1A. Introductory Biology (5) I, II, III. The Staff (Microbiology)

Lecture—4 hours; discussion—1 hour. Prerequisite: Chemistry 1B (may be taken concurrently). Introduction to biological molecules, bioenergetics, cell structure and function, elements of molecular biology, and viruses. Interdisciplinary course designed for majors in the biological sciences. This course replaces course 1.

1B. Introductory Biology (5) I, II, III. The Staff (Zoology)

Lecture—3 hours; discussion-laboratory—4 hours. Prerequisite: course 1A. Continuation of course 1A. Topics covered include transmission genetics, systematics, evolution, survey of the animal kingdom, comparative anatomy, physiology, and adaptation in animals. This course replaces Zoology 2 and 2L.

1C. Introductory Biology (5) I. Kyhos (Botany), II. Webster/Bonner, Murphy (Botany); III. O'Neill/Stanton/Stemler, Thornton (Botany)

Lecture—4 hours; laboratory—3 hours. Prerequisite: course 1B. Continuation of course 1B. Topics covered include a survey of bacteria, protozoa, algae and plants, structure and function of plant tissue, adaptive development and evolution of plants, population ecology, ecosystem analysis and human evolution. This course replaces Botany 2.

10. General Biology (4) I. Leslie (Zoology); II. Marr (Microbiology); III. Falk (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 1A. General Education credit: Nature and Environment/Introductory.

11A-11B. Issues in the Life Sciences (2-2) I, II. Villarejo

Lecture—1 hour; discussion—1 hour. Prerequisite: enrollment limited to BUSP students; consent of instructor required. Designed to broaden the students' understanding of biology by demonstrating the range of subjects and approaches included in the field of biology. Both basic biological research topics and applied biology will be studied.

19. Biology of Cancer (3) III. Pfeiffer (Biological Sciences, Microbiology)

Lecture—3 hours. Prerequisite: course 1A or 10, or Genetics 10, or Physiology 10. Interdisciplinary course offers an introduction to the biological, clinical and psycho-social aspects of cancer, and emphasizes basic understanding of biological principles and facts about the disease process. Designed for students with little scientific background. Offered in alternate years.

98. Directed Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

120. Developmental Biology of Marine Invertebrates (4) III. Clark, Chang and Jeffery (Biological Sciences)

Lecture—30 hours total; laboratory—30 hours total.

Prerequisite: Zoology 100-100L, Biochemistry 101A-101B or Physiological Sciences 101A-101B; course 123 concurrently. Phylogenetic patterns of reproduction and development among the marine invertebrates. Emphasis on both modern and classical approaches to understanding gametogenesis, gamete interaction and fertilization, cleavage, cell differentiation, morphogenesis, and larval development and metamorphosis. Course offered at Bodega Marine Laboratory. (See above description for Bodega Marine Laboratory Program.)

120P. Developmental Biology of Marine Invertebrates/Advanced Laboratory Topics (4) III. Clark, Chang and Jeffery (Biological Sciences)

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. (See above description for Bodega Marine Laboratory Program.)

121. Physiological Adaptation of Marine Organisms (4) III. Clegg and Crowe (Zoology)

Lecture—30 hours total; laboratory—30 hours total. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B; Physics 5A-5B-5C; course 123 (concurrently). Physiological adaptation to the environment among organisms in marine and estuarine habitats. Course offered at Bodega Marine Laboratory. (See above description for Bodega Marine Laboratory Program.)

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. (See above description for Bodega Marine Laboratory Program.)

123. Undergraduate Colloquium in Marine Science (1) III. Clark (Biological Sciences)

Seminar—1 hour. Prerequisite: enrolled student at the Bodega Marine Laboratory. Series of weekly seminars by recognized authorities in various disciplines of marine science from within and outside the UC system. Includes informal discussion with speaker. Course will be held at Bodega Marine Laboratory. (P/NP grading only.) (See above description for Bodega Marine Laboratory Program.)

194H. Research Honors (2) I, II, III.

Independent study—6 hours. Prerequisite: senior standing. Students majoring in Biological Sciences who have completed two quarters (3-5 units per quarter) of 199 and who qualify for the honors program as defined by the current catalog. Opportunity for Biological Sciences majors to pursue intensive research culminating in the writing of a senior thesis with the guidance of faculty advisers. (P/NP grading only.)

197T. Tutoring in Biological Sciences (1-3) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: upper division standing; appropriate background in biological sciences. Assisting in courses in Biological Sciences under the direction of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)

Prerequisite: consent of instructor. Division of Biological Sciences staff members may offer group study courses under this number.

Professional Course

310. Effective Teaching of College Biology (2) 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
(916-752-1135 or 752-2504)

Group Office, 3078 Bainer Hall (Chemical Engineering), (916-752-2504/0400)

Faculty. Includes faculty members from the three colleges, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Biomedical Engineering offers programs of study and research leading to the M.S. and Ph.D. degrees. The programs of study are intended to prepare students for professional work in the effective integration of engineering with biology and medical sciences, including modeling of biological systems and the design of devices and procedures useful for human and veterinary medicine. It is a broad interdepartmental program which is best suited for students who are capable and comfortable with considerable independence. Each student together with an adviser defines a specific course of study suited to individual goals.

Preparation. The Group regards strong competence in mathematics and engineering as necessary for successful completion of study. Prior course work in these areas is emphasized in the evaluation of applications. Some such training can in principle be acquired after admission to the Group, but it generally necessitates one or more additional years of study.

Faculty Advisers. 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 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.

223. Multibody Dynamics (4) II. Hubbard and Eke
Lecture—3 hours; discussion—1 hour. Prerequisite: Mechanical Engineering 222. Dynamics of coupled rigid bodies; multibody kinematics; Euler and Tate-Bryan angles; Euler and Rodriguez parameters; constrained motion; nonholonomic systems; inertia dyadics; generalized active and inertia forces; Kane, Newton-Euler, and Lagrange formulations for multibody systems; computer-aided equation derivation.

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 modeling. (Same as Physical Education 227.)

231. Musculo-Skeletal System Biomechanics (3) III. Hull

Lecture—3 hours. Prerequisite: Engineering 102B, Mechanical Engineering 176. Mechanics of skeletal muscle and mechanical models of muscle, solution of the inverse dynamics problem, theoretical and experimental methods of kinematic and kinetic analysis, computation of intersegmental load and muscle forces, applications to gait analysis and sports biomechanics. Offered in alternate years.

232. Orthopaedic Biomechanics (3) III. Martin
Lecture—3 hours. Prerequisite: graduate standing. Introduction to the biomechanics of the skeleton. Analysis of musculoskeletal forces, overviews of the mechanical properties of bone, bone growth, modeling, remodeling, and repair; bone structure composition, quantitative histomorphometry, and techniques of surgical repair.

***252. Advanced Information Systems (3) II.** Waters
Lecture—2 hours; laboratory—2 hours Prerequisite: experience in initial phases of data preparation, editing and sorting; Computer Science Engineering 168 or the equivalent; must be able to perform at graduate level. To increase through examples, projects and discussions, understanding of the components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in the solution of specific problems in the creation, design and implementation of information systems.

290. Seminar (1) I, II, III. Katz

Seminar—1 hour. Seminar in biomedical engineering. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

299. Research (1-12) I, II, III, IV. The Staff (S/U grading only.)

Biophysics (A Graduate Group)

Richard Nuccitelli, Ph.D., Chairperson of the Group
Group Office, 2320 Storer Hall (916-752-7468)

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. A.H. Maki (*Chemistry*).

Graduate Courses

200. Current Techniques in Biophysics (2) III. A.H. Maki

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 (Chairperson in charge)

Laboratory—18 hours (5 weeks). Prerequisite: course 200 (may be taken concurrently). Laboratory assignment in the research laboratory of a Biophysics Graduate Group faculty member. Individual research problems with emphasis on methodological/procedural experience and experimental design.

200LB. Biophysics Laboratory (6) I, II, III. The Staff (Chairperson in charge)

Laboratory—two 18-hour rotations (5 weeks each). Prerequisite: course 200 (may be taken concurrently). Two five-week laboratory assignments in the research laboratories of Biophysics Graduate Group faculty members. Individual research problems with emphasis on methodological/procedural experience and experimental design.

290C. Research Conference in Biophysics (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: graduate standing in Biophysics and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in biophysics. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Botany

(College of Letters and Science)

Robert W. Pearcy, Ph.D., Chairperson of the Department

Department Office, 143 Robbins Hall (916-752-0617)

Faculty

Fredrick T. Addicott, Ph.D., Professor Emeritus

Lars Anderson, Ph.D., 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 Emeritus

Paul A. Castellfranco, Ph.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*)

Richard H. Falk, Ph.D., Professor

Ernest M. Gifford, Jr., Ph.D., Professor Emeritus

John J. Harada, Ph.D., Associate Professor

Hendrik J. Ketellapper, Ph.D., Professor Emeritus

Donald W. Kyhos, Ph.D., Professor

Norma J. Lang, Ph.D., Professor Emeritus

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

Sharman O'Neill, Ph.D., Assistant Professor

Robert W. Pearcy, Ph.D., Professor

Marcel Rejmanek, Ph.D., Associate Professor

Thomas L. Rost, Ph.D., Professor

Maureen L. Stanton, Ph.D., Associate Professor

Alan J. Stemler, Ph.D., 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 Weiler, Ph.D., Professor Emeritus

Kenneth Wells, Ph.D., Professor Emeritus

The Major Programs

Botany is the study of plants. This study includes many specialized areas: anatomy, cell and molecular biology, morphology, systematics and plant evolution, physiology, ecology, phycology, mycology, and weed science.

The Program. The Bachelor of Science degree in botany provides two options. Option I is for students who plan advanced study in botany or a related field and who wish to obtain a general secondary teaching credential or training for a position requiring detailed knowledge of plants. Option II is for students who plan advanced study in the physiology and/or biochemistry of plants. Students who wish a less intensive program in botany, but one that acquaints them with plant biology and its importance, should elect the Bachelor of Arts major program.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

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. 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.

Career Alternatives. 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.

A.B. Major Requirements

	UNITS
Preparatory Subject Matter	39-41
Biological Sciences 1A, 1B, 1C	15
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, 111, 112, 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	80-83

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.

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	58-63
Biological Sciences 1A, 1B, 1C	15
Chemistry 1A, 1B, 1C.....	15
Chemistry 8A-8B or 128A-128B-128C- 129A.....	6-11
Physics 6A, 6B, 6C.....	12
Mathematics 16A, 16B.....	8
Statistics 13 or 102.....	4
Depth Subject Matter	47
Biochemistry 101A, 101B.....	6
Genetics 100.....	4
Botany 105, 108, 111, 111L, 112, 116, 117, 118, 119.....	37
Total Units for the Major	105-110

Recommended

Botany 199 (3-5 units); German, French, or Russian. For students with interests in specialized areas of botany (e.g., agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.), certain substitutions, including courses in other departments, may be allowed on prior consultation with a botany major adviser.

Option II: For those who plan advanced study in physiology and/or biochemistry of plants.

	UNITS
Preparatory Subject Matter	56-68
Biological Sciences 1.....	5
Botany 2.....	5
Chemistry 1A-1B-1C-5 or 4A-4B-4C...15-19	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	51-54
Biochemistry 101A, 101B, 101L, 122.....	15
Botany 105, 111, 111L, 112.....	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	12-15
(b) Morphology and cytology: Botany 116, 130, 140	12-15
(c) Phycology and mycology: Botany 114, 118, 119	12-15
(d) Ecology: Botany 117	12-15
Total Units for the Major	107-122

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

College of Agricultural and Environmental Sciences students.....24
English and/or rhetoric.....8
Social sciences and/or humanities.....16
See also the Bachelor's Degree Requirements section for additional requirements.

College of Letters and Science students:
Refer to the Bachelor's Degree Requirements section for a description of requirements to be completed in addition to the major.

Major Adviser: M. Rejmanek.

Minor Program Requirements:

	UNITS
Botany	23
To satisfy the requirements for a Botany minor, a student must complete Biologi-	

cal Sciences 1C (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 111, 112, 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

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)
Internship—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
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to evolutionary principles and processes, emphasizing plants. Topics include: mutation, selection, gene flow, chromosome evolution, speciation, adaptive radiation, reconstruction of evolutionary relationships, evolutionary rates and trends, and origin of new groups.

101. Survey of Plant Communities of California (4) III. Barbour
Lecture—2 hours; fieldwork—1 hour; term paper. Prerequisite: consent of instructor; Biological Sciences 1C 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 preparation: Botany 10.

102. California Floristics (5) III. Webster

Lecture—2 hours; lecture-discussion—1 hour; laboratory—6 hours (includes three one-day, weekend field trips). Prerequisite: Biological Sciences 1A, 1B, 1C or the equivalent in plant science. Survey of the flora of California, with emphasis on field recognition and identification of important vascular plant families and genera characterizing the major floristic regions. Lectures review the taxonomic diversity, evolutionary relationships, and geographical patterns of California flora.

105. Developmental Plant Anatomy (5) I. Rost

Lecture—3 hours; laboratory—6 hours. Prerequisite: Introductory plant biology (for example, Biological Sciences 1C). Survey of vascular plant structure and development. Current ideas and experimental evidence for developmental concepts.

108. Systematic Botany of Flowering Plants (5) III. The Staff

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Laboratory and field studies of the characters and relationships of the principal families and orders of flowering plants. Principles of taxonomy. Practice in identification of species by means of keys.

111. Plant Physiology (3) I. Lucas, Stemler

Lecture—3 hours. Prerequisite: Biological Sciences 1C; Chemistry 8B (may be taken concurrently); Physics 5A, 5B, 5C recommended. Fundamental activities of plants; the plant cell as a functioning unit. Processes of absorption, movement, and utilization of water and minerals. Water loss, translocation, photosynthesis, respiration.

111D. Problems in Plant Physiology (1) I. Lucas, Stemler

Discussion—1 hour. Prerequisite: course 111 concurrently. Discussion of problems and applications relating to principles presented in course 111. Students will be assigned problems each week showing novel applications of principles described in course 111 and will prepare answers to be delivered orally during the class period. (P/NP grading only.)

***111L. Introductory Plant Physiology Laboratory (3) III.**

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 111 (may be taken concurrently). Introduction to basic experimental techniques and instrumentation used in the investigation of plant physiological processes such as water-solute absorption and their movement and utilization; translocation; transpiration; photosynthesis; respiration; growth; development and reproduction.

112. Plant Growth and Development (3) II. Thornton
Lecture—3 hours. Prerequisite: Biological Sciences 1C; Chemistry 8B; course 111 and Biochemistry 101A recommended. Processes, dynamics, and control of growth and development. Metabolism.

112D. Problems in Plant Growth and Development (1) II. Thornton

Discussion—1 hour. Prerequisite: course 112 concurrently. Discussion of problems and applications relating to principles presented in course 112. Students will be assigned problems each week showing novel applications of the principles described in course 112 and will prepare answers to be delivered orally during class period. (P/NP grading only.)

***114. Fungi and Algae (5) III. The staff**

Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to the morphology, taxonomy, evolution, and physiology of the fungi and algae. Not open for credit to students who have completed course 118 or 119.

116. Morphology and Evolution of Vascular Plants (4) II. Gifford

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. 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. Pearcy, Barbour

Lecture—3 hours; three to five field trips (Friday or weekend). Prerequisite: Biological Sciences 1A, 1B, 1C; course 111B and course 102 or 108 strongly recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 cannot receive credit for course 101.

118. Phycology (5) II. Lang

Lecture—3 hours; laboratory—6 hours; one weekend field trip. Prerequisite: Biological Sciences 1A, 1B, 1C. 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. The Staff

Lecture—3 hours; laboratory—6 hours; one weekend field trip. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to structure, ontogeny, and taxonomy of selected species of the major divisions of the fungi.

120. Introduction to Weed Science (3) II. Bayer

Lecture—2 hours; discussion—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C; Chemistry 8A, 8B. Principles of weed science including mechanical, biological, and chemical control methods. Weed control in crop, pasture, range, brush, forests, aquatic, and non-crop situations. Types of herbicides. Application of herbicides. Sight identification of common weeds and demonstrations to illustrate the principles.

121. Biology of Weeds (3) III. Rejmanek

Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Origin and evolution, beneficial and harmful aspects, reproduction and dispersal, seed germination and dormancy, growth and development, ecology, interaction of weeds and crops, natural succession, and herbicide-induced succession. Laboratories will emphasize taxonomy of weeds and demonstrate principles discussed in lectures.

122. Action of Herbicides (3) III. The Staff

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 120; Soil Science 100; courses 111, 111D recommended. Influence of plants and soils on the action of herbicides. Absorption, translocation, fate, mechanism of action and symptoms of herbicides in plants. Effects of herbicides on plant populations. Physical and molecular fate of herbicides in soils.

125. Molecular Biology of Plant Development (3) III. Murphy

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C; Biochemistry 101B; Genetics 102A or course 111. Gene expression and gene structure and their influence on growth and differentiation of higher plant tissues.

130. Survey of Cell Biology (4) I. Theg, Leslie (Zoology)

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B or 128C; introductory course in biochemistry strongly recommended. A survey of cell biology presenting the structure and function of the major cell organelles. Topics discussed include general cell structure, membranes, bioenergetics, motility, cell synthesis, and cell division. Not open to students who have received credit for Zoology 121A or 121B. (Same course as Zoology 130.)

135. Mineral Nutrition of Plants (4) III. J. Richards (Land, Air and Water Resources) and Brown (Pomology)

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 111 or the equivalent. Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; mineral metabolism; deficiencies and toxicities; genetic and ecological aspects of plant nutrition. (Same course as Plant Science 135.)

***140. Paleobotany (4) III.**

Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Introduction to plant fossil record, beginning with invasion of land in the Silurian, emphasizing origin and evolution of major

groups and adaptations and changing composition and distribution of floras in relation to plate tectonics and climatic change.

***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 alternate years.

150. Biology and Management of Freshwater Macrophytes (3) I. Anderson

Lecture—3 hours; two field trips. Prerequisite: Biological Sciences 1A, 1B, 1C, Chemistry 8B; course 111 or Water Science 122 recommended. Brief survey of common fresh water macrophytes, their reproductive modes, physiology, growth (photosynthesis, nutrient utilization), development (hormonal interactions), ecology and management. Offered in alternate years.

***155. Anatomical and Cytological Methods (4) III. The Staff**

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Practical laboratory methods in preparing biological materials for examination with the light microscope; special emphasis given to localization of cell constituents; introduction to photomicrography and autoradiography.

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)

Internship—3-36 hours. Prerequisite: upper division standing; consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the 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

Tutoring—1-5 hours. Prerequisite: upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience. Student contact will be primarily in laboratory or discussion sections. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**202. Plant Ecophysiology (3) II. Pearcy**

Lecture—3 hours. Prerequisite: courses 111, 112, 117, and consent of instructor. Study of the mechanisms of physiological adaptation of plants to their environment. Offered in alternate years.

203. Ecophysiological Methods (3) III. Pearcy

Lecture—1 hour; laboratory—4 hours; individual project; one Saturday field trip to be arranged. Prerequisite: courses 111, 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 112; Chemistry 107A or consent of instructor. Cellular physiology, plant water relations, translocation and membrane transport.

***205B. Advanced Plant Physiology (3) II.** Theg, Stemler
Lecture—3 hours. Prerequisite: course 112, Biochemistry 101B. Photosynthesis, respiration, and general plant metabolism.

205C. Advanced Plant Physiology (3) I. The Staff
Lecture—3 hours. Prerequisite: course 112; Biochemistry 101A; courses 205A, 205B and 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. Castellfranco
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.** The Staff
Laboratory—9 hours. Prerequisite: course 205C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205C.

***212. Physiology of Herbicidal Action (3) II.** Bayer
Lecture—3 hours. Prerequisite: courses 112, 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 5B. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis. Course offered in alternate years.

***221. Special Topics in Plant Physiology (2) III.** The Staff
Discussion—1 hour; seminar—1 hour. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures required. May be repeated for credit. (S/U grading only.)

***222. Special Topics in Plant Morphology, Systematics, and Ecology (2) II.** The Staff
Seminar—2 hours. Analysis of recent advances in plant structure and evolution. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures required. May be repeated once for credit. (S/U grading only.) Offered in alternate years.

227. Plant Molecular Biology (4) I. Harada
Lecture-discussion—4 hours. Prerequisite: 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. (Same

course as Vegetable Crops 228.)

231. Biological Electron Microscopy (1) I. Falk
Lecture—1 hour. Prerequisite: consent of instructor. Introduction to biological electron microscopy. Areas covered are: electron optics, electron specimen interactions, and vacuum systems.

231L. Biological Electron Microscopy Laboratory (3) I. Falk
Laboratory—9 hours. Prerequisite: consent of instructor; course 231 (may be taken concurrently). Introduction to biological electron microscopy. Areas covered are: specimen preparation and microscope operation. Limited enrollment.

***240. Paleobotany and Angiosperm Evolution (4) I.** Doyle
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 108, 116, or 140. Critical analysis of the plant fossil record as a source of evidence on origin, evolution, and phylogeny of the angiosperms, Cretaceous and Tertiary climates, geographic history of modern taxa, and origin of modern vegetation types. Offered in alternate years.

***243. Palynology (4) I.** Doyle
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108, 116, or 140. Morphology of spores and pollen grains and their use in stratigraphy, plant systematics and evolution, and paleoecology. Techniques for study of modern spores and pollen and extraction and identification of fossil palynomorphs from sediments of Paleozoic to Quaternary age. Offered in alternate years.

***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—atomy, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories.

***256A. Experimental Plant Taxonomy (2) II.** Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 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 alternate years.

***256B. Experimental Plant Taxonomy (2) III.** Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. Continuation of course 256A. Study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships. Offered in alternate years.

290. Seminar (1) I. Norris; II. The Staff; III. Kyhos
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, II, III. The Staff
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)
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)

Students admitted into the Botany Graduate Group before June 10, 1989 will be allowed to complete their degree in this subject.

New students, however, should see the Plant Biology Graduate Group section in this catalog.

Information. 152 Robbins (916-752-7094).

Cantonese

See Asian American Studies

Cell and Developmental Biology (A Graduate Group)

Carol A. Erickson, Ph.D., Chairperson of the Group
(916-752-8318)

Group Office, 2320 Storer Hall (916-752-7468)

Faculty. The group includes 37 faculty members from 17 departments in the College of Agricultural and Environmental Sciences, College of Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Cell and Developmental Biology offers programs of study leading to the Ph.D. degree. Cell and Developmental Biology is a broad interdepartmental program. The curriculum consists of core courses in cell biology or developmental biology. Specific programs of study are decided upon by an advisory committee chaired by the student's research adviser, and the choice of major core courses will reflect the student's primary research interest.

Preparation. Appropriate preparation is an undergraduate degree in a biological or physical science. Preparation should include a year of calculus, physics, general chemistry and organic chemistry, and introductory courses in statistics, biochemistry, genetics and biology.

Graduate Advisers. C.A. Erickson (*Zoology*), S. Meizel (*Cell Biology and Human Anatomy*).

Courses in Cell and Developmental Biology

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 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). Assignments 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 Lecture—1 hour and discussion 1/2 hour (course hours entered to run sequentially); student presents critical analysis of current journal article and submits written outline and reference list for that publication. General organization of the cytoskeleton; introduction to cytoskeletal proteins: actin, tubulin, intermediate filaments, myosin, and other associated proteins. Presentation of current problems related to specialized cytoskeletal systems. Topics vary. (S/U grading only.) Offered in alternate years.

290. Current Topics in Cell and Developmental Biology (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their research activities. May be repeated for credit. (S/U grading only.)

290C. Research Conference in Cell and Developmental Biology (1) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour. Prerequisite: graduate standing in Cell and Developmental Biology and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in cell and developmental biology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Cell Biology and Human Anatomy

See Medicine, School of

Chemistry

(College of Letters and Science)

Kevin M. Smith, Ph.D., Chairperson of the Department

William H. Fink, Ph.D., Vice-Chairperson of the Department

Peter A. Rock, Ph.D., Vice-Chairperson of the Department

Department Office, 108 Chemistry Building
(916-752-0503/0953; FAX 916-752-8995)

Faculty

Thomas L. Allen, Ph.D., Professor
Lawrence J. Andrews, Ph.D., Professor Emeritus
Alan L. Balch, Ph.D., Professor
Albert T. Bottini, Ph.D., Professor
Robert K. Brinton, Ph.D., Professor Emeritus
R. David Britt, Ph.D., Assistant Professor
Joyce T. Dol, Ph.D., Associate Adjunct Professor
Timothy C. Donnelly, Ph.D., Lecturer
W. Ronald Fawcett, Ph.D., Professor
William H. Fink, Ph.D., Professor
Edwin C. Friedrich, Ph.D., Professor
Sevdi 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. Kelzer, Ph.D., Professor
Peter B. Kelly, Ph.D., Assistant Professor
Richard E. Kepner, Ph.D., Professor Emeritus
Mark J. Kurth, Ph.D., Professor
Gerd N. LaMar, Ph.D., Professor
Donald P. Land, Ph.D., Assistant Professor
Carlioto B. Lebrilla, Ph.D., Assistant Professor
August H. Maki, Ph.D., Professor
Donald A. McQuarrie, Ph.D., Professor
Claude F. Meares, Ph.D., Professor
R. Bryan Miller, Ph.D., Professor
Tadeusz F. Molinski, Ph.D., Assistant Professor
W. Kenneth Musker, Ph.D., Professor
Krishnan P. Nambiar, Ph.D., Assistant Professor
Michael H. Nantz, Ph.D., Assistant Professor
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
Carl W. Schmid, Ph.D., Professor
Neil E. Schore, Ph.D., Professor
Kevin M. Smith, Ph.D., Professor
James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Professor
Nancy S. True, Ph.D., Professor
Susan C. Tucker, Ph.D., Assistant Professor
David H. Volman, Ph.D., Professor Emeritus
Fred E. Wood, Ph.D., Lecturer
George S. Zweifel, Sc.D., Professor

The Major Programs

Chemistry studies the composition of matter, its structure, and the means by which it is converted from one form to another.

The Program. Two programs in chemistry are available, one leading to the Bachelor of Arts and the other to the Bachelor of Science. Students who are interested in chemistry as a profession would normally elect the program leading to the B.S. degree, which is accredited by the American Chemical Society. The curriculum leading to an A.B. degree offers a less intensive program in chemistry and is appropriate for a student with a strong interest in chemistry, but who also has another goal such as professional school preparation or secondary school teaching.

Career Alternatives. Chemistry graduates with bachelor's degrees are employed extensively throughout industry in production supervision, quality control, technical marketing, and other areas of applied chemistry. Some of the firms employing these graduates are in the food and beverage processing industries, the petroleum industry, paper and textile production and processing, the chemical industry, pharmaceuticals, and the photographic industry. The bachelor programs also provide chemistry graduates with the rigorous preparation needed for the advanced degrees required for careers in research and education.

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
Chemistry 1A-1B-1C-5 or 4A-4B-4C...	36-43
Physics 5A-5B-5C	12

Mathematics 21A-21B-21C or 16A-16B-16C9-12

Depth Subject Matter36
Chemistry 110A, 110B, 110C, 124A, 128A, 128B, 128C, 129A, 129B25
At least 11 additional upper division units in chemistry (except Chemistry 107A or 107B), biochemistry, or physics.....11

Total Units for the Major72-79

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	49-53
Chemistry 1A-1B-1C-5 or 4A-4B-4C...	15-19
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 22B; 22A or 22C	18

Depth Subject Matter47
Chemistry 110A, 110B, 110C, 111, 115, 124A, 124B or 124C, 128A, 128B, 128C, 129A, 129B, 129C

Total Units for the Major96-100

Major Advisers. A.T. Bottini, W.H. Fink, E.C. Friedrich, R.E. Kepner, P.A. Rock, C.W. Schmid, N.E. Schore, D.S. Tinti, F.E. Wood.

Honors and Honors Program. The student must take a minimum of 6 units of course 194H spread out over a minimum of two quarters with a comprehensive written report of the project submitted at the end of the final quarter.

Graduate Study. The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees in Chemistry. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Chemistry. See also the Graduate Division section in this catalog.

Courses in Chemistry

Lower Division Courses

1A. General Chemistry (5) I. Donnelly, McQuarrie, Wood; II. Allen, Lamar, McQuarrie, Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: high school chemistry and physics recommended; satisfactory score on Diagnostic Examination or course 9 with a grade of C or better. 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, Donnelly, Rock, _____, III. Rock, _____, 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. Donnelly, _____; III. Britt, 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. Tinti, Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21A (may be taken concurrently), high school chemistry and physics,

satisfactory score on Diagnostic Examination or course 9 with a grade of C or better. 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. Swinehart

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. Lebrilla; III. Donnelly

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 of credit only; not open to students who have received credit for 4A-4B-4C. (CAN Chem 12)

8A. Organic Chemistry: Brief Course (3) I. S. Friedrich, —; II. Issidorides

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) II. Doi; III. S. Friedrich

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8A. Continuation of course 8A. The laboratory is concerned primarily with the study of the properties and chemistry of the common classes of organic compounds.

9. Introduction to General Chemistry (2) I. Wood
Lecture/discussion—3 hours. Prerequisite: chemistry diagnostic exam; not open for credit to students who have passed the exam or completed course 1A or 4A. Introduction to chemistry. Students who complete course 9 will receive only 3 units for course 1A or 4A. Course 9 must be taken for a letter grade and may not be repeated.

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. Fink

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 pro-

cesses 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. Schmid

Lecture—3 hours. Prerequisite: course 107A or 110A. Continuation of course 107A. Electrochemistry and the thermodynamics of simple electrolyte solutions. Chemical rate processes. Introduction to spectroscopy, atomic and molecular structure, x-ray crystallography, radiation and nuclear chemistry, and to surface chemistry and colloidal systems. Considerations on bioirreversible processes.

108. Physical Chemistry of Macromolecules (3) III. Mears

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. Kelly; III. Lebrilla

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, II. Maki

Lecture—3 hours. Prerequisite: course 110A. Atomic and molecular structure and spectra.

110C. Physical Chemistry: Kinetics (3) II. Keizer; 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: courses 110C (may be taken concurrently) and 115. Introduction to the chemical literature, methods of data analysis, techniques of physical measurements, vacuum systems. Laboratory experiments from the areas of thermodynamics, spectroscopy, and kinetics.

115. Instrumental Analysis (4) II. Fawcett

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110A. Theory and practice of modern instrumental techniques of chemical analysis with emphasis on electroanalytical and spectroscopic methods and separation science. Introduction to instrumentation electronics. Laboratory focuses on trace analyses of samples having practical significance.

118A. Organic Chemistry for Health and Life Sciences (4) I, III. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C- or higher. The 118A, 118B, 118C series is designed to fulfill the requirements of students planning professional school studies in health and life sciences. A rigorous, in-depth presentation of basic principles with emphasis on stereochemistry and on preparation and reactions of nonaromatic hydrocarbons, alkyl halides, alcohols and ethers.

118B. Organic Chemistry for Health and Life Sciences (4) I, II. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 118A. Continuation of course 118A, with emphasis on spectroscopy and the preparation and reactions of aromatic hydrocarbons, organometallic compounds, aldehydes and ketones.

118C. Organic Chemistry for Health and Life Sciences (4) II, III. The Staff

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 118B. Continuation of course 118B, with emphasis on the preparation, reactions and identification of carboxylic acids and their derivatives, alkyl and acyl amines, β -dicarbonyl compounds, and various classes of naturally occurring, biologically important compounds.

120. Physical Chemistry Laboratory: Advanced Methods (3) II. Hope

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 110C and 111. Design of experiments; experimental control and data acquisition using microcomputers. Laboratory emphasizes the use of microcomputers in advanced physical-chemical experiments.

121. Introduction to Molecular Structure and Spectra (4) III. True

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. Land
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. Swinehart

Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of inorganic and heteroorganic molecules containing the main group elements.

124C. Inorganic Chemistry: d and f Block Elements (3) III. Balch

Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of transition metal complexes, organometallic and bioinorganic chemistry, the lanthanides and actinides.

128A. Organic Chemistry (3) I. Kurth; II. Schore

Lecture—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; chemistry majors should enroll in course 129A concurrently. Introduction to the basic concepts of organic chemistry with emphasis on stereochemistry and the chemistry of hydrocarbons. Designed primarily for majors in chemistry. Only two units credit allowed students who have had course 8B.

128B. Organic Chemistry (3) I. Nantz; II. Musker; III. Molinski

Lecture—3 hours. Prerequisite: course 128A or consent of instructor, course 129A strongly recommended; chemistry majors should enroll in course 129B concurrently. Continuation of course 128A with emphasis on aromatic and aliphatic substitution reactions, elimination reactions, and the chemistry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

128C. Organic Chemistry (3) I. Miller; 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. Issidorides; II. S. Friedrich

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; course 128A (may be taken concurrently). Introduction to laboratory techniques of organic chemistry. Emphasis is on methods used for separation and purification of organic compounds. Only one unit of credit will be allowed for students who have taken course 8B.

129B. Organic Chemistry Laboratory (2) I. Musker; II. Issidorides; III. Issidorides

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. Bottini

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. Musker

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. Molinski
Lecture—3 hours. Prerequisite: course 128C. Chemistry of terpenes, steroids, acetogenins, and alkaloids; isolation, structure determination, biosynthesis, chemical transformations, and total synthesis.

192. Internship in Chemistry (1-6) I, II, III. The Staff (Chairperson in charge)

Internship—3-18 hours. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised internship in chemistry; requires a final written report. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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.)

195. Industrial Chemistry (1) I. Wood

Seminar—2 hours. Prerequisite: junior or senior standing in Chemistry. Designed to give Chemistry undergraduate students an in-depth perception of careers in the chemical industry. Professional chemists will give seminars describing both research and career insights. The research seminar will be technical while the career-oriented seminar will be more general. (P/NP grading only.)

197. Projects in Chemical Education (1-4) I, II, III. The Staff (Chairperson in charge)

Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, autotutorial modules or assistance with laboratory sessions. May be repeated for credit for a total of 12 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics and physics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

Graduate Courses

201. Basic Chemical Uses of Symmetry and Group Theory (2) I. Kaulzarich

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. Kelly

Lecture—3 hours. Prerequisite: course 201 or the equivalent. Vibrational and rotational spectra; electronic spectra and photoelectron spectroscopy; magnetism; electron spin and nuclear quadrupole resonance spectroscopy; nuclear magnetic resonance spectroscopy; other spectroscopic methods.

210A. Quantum Chemistry: Introduction and Stationary-State Properties (3) II. Tinti

Lecture—3 hours. Prerequisite: course 110B and

110C or consent of instructor. Stationary-state quantum chemistry; postulates of quantum mechanics, simple solutions, central field problems and angular momenta, hydrogen atom, perturbation theory, variational theory, atoms and molecules.

210B. Quantum Chemistry: Time-Dependent Systems (3) III. Tucker

Lecture—3 hours. Prerequisite: course 210A. Matrix mechanics and time-dependent quantum chemistry; Matrix formulation of quantum mechanics, Heisenberg representation, time-dependent perturbation theory, selection rules, density matrices, and miscellaneous molecular properties.

210C. Quantum Chemistry: Molecular Spectroscopy (3) I. True

Lecture—3 hours. Prerequisite: course 210B. Molecular spectroscopy: Born-Oppenheimer approximation, rotational, vibrational and electronic spectroscopy, spin systems, and molecular photophysics.

211A. Advanced Physical Chemistry: Statistical Thermodynamics (3) I. Britt

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 alternate years.

212. Chemical Dynamics (3) II. Jackson

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to modern concepts in chemical reaction dynamics for graduate students in chemistry. Emphasis will be placed on experimental techniques as well as emerging physical models for characterizing chemical reactivity at a microscopic level. Offered in alternate years.

215. Theoretical and Computational Chemistry (3) III. 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 alternate years.

216. Magnetic Resonance Spectroscopy (3) II. Maki, LaMar

Lecture—3 hours. Prerequisite: courses 210A, 210B (may be taken concurrently). Quantum mechanics of spin and orbital angular momentum, nuclear magnetic resonance, theory of chemical shift and multiplet structures, electron spin resonance, theory of g-tensor in organic and transition ions, spin Hamiltonians, nuclear quadrupole resonance, spin relaxation processes. Offered in alternate years.

217. X-Ray Structure Determination (3) 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.** Meares

Lecture—3 hours. Prerequisite: course 211A or the equivalent. Relationship of higher order macromolecular structure to subunit composition; equilibrium properties and macromolecular dynamics; physical-chemical determination of macromolecular structure. Offered in alternate years.

219. Spectroscopy of Organic Compounds (3) I. B. Friedlrich

Lecture—3 hours. Prerequisite: course 128C or the equivalent. Identification of organic compounds and investigation of stereochemical and reaction mechanism phenomena using spectroscopic methods—

principally NMR, IR, and MS.

221A-H. Special Topics in Organic Chemistry (3) I, II, III. The Staff

Lecture—3 hours. Selected topics of current interest in organic chemistry. Topics will vary each time the course is offered, and in general will emphasize the research interests of the staff member giving the course.

226. Principles of Transition Metal Chemistry (3) I. Balch

Lecture—3 hours. Prerequisite: course 124A or the equivalent. Electronic structures, bonding, and reactivity of transition metal compounds.

***228A. Bioinorganic Chemistry (3) III.** Swinehart

Lecture—3 hours. Prerequisite: course 226 or consent of instructor. Defines role of inorganic chemistry in the functioning of biological systems by identifying the functions of metal ions and main group compounds in biological systems and discussing the chemistry of model and isolated biological compounds. Offered every third year (next offering Spring 1994).

***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 1993).

228C. Solid-State Chemistry (3) III. Kaulzarich

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 1992).

231. Organic Synthesis: Methods and Strategies (3) III. Nantz

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.** Miller

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 organic synthesis. Offered in alternate years.

240. Advanced Analytical Chemistry (3) I. Fawcett

Lecture—3 hours. Prerequisite: courses 110A and 115 or the equivalent. Numerical treatment of experimental data; thermodynamics of electrolyte and non-

*Course not offered this academic year.

electrolyte solutions; complex equilibria in aqueous and non-aqueous solutions; potentiometry and specific ion electrodes; mass transfer in liquid solutions; fundamentals of separation science, including column, gas and liquid chromatography.

241A-D. Special Topics in Analytical Chemistry (3) III. 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. The Staff

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

293. Introduction to Chemistry Research (1) I. The Staff (Smith in charge)

Discussion—2 hours. Designed for incoming graduate students preparing for higher degrees in chemistry. Group and individual discussion of research activities in the Department and research topic selection. (S/U grading only.)

295. Industrial Chemistry (1) I. Kurth

Seminar—2 hours. Prerequisite: graduate standing in Chemistry. Designed to give Chemistry graduate students an in-depth perception of careers in the chemical industry. Professional chemists will give seminars describing both research and career insights. The research seminar will be technical while the career-oriented seminar will be more general. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

The laboratory is open to qualified graduate students who wish to pursue original investigation. Students wishing to enroll should communicate with the department well in advance of the quarter in which the work is to be undertaken. (S/U grading only.)

Professional 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.)

392. Advanced Methods of Teaching Chemistry

(2) III. Wood

Lecture—2 hours. Prerequisite: course 390. Advanced topics in teaching chemistry. Analysis and discussion of curricular design, curricula materials, teaching methods and evaluation. For students who are planning a career in teaching chemistry. (P/NP grading only.)

Chicano Studies

(College of Letters and Science)

Refugio I. Rochin, Ph.D., Program Director
Program Office, TB 101 (916-752-2421)

Committee in Charge

Angie C. Chabram, Ph.D. (*Chicano Studies, Spanish*)

Richard A. Figueroa, Ph.D. (*Education*)

Yvette Flores-Ortiz, Ph.D. (*Chicano Studies*)

Barbara J. Merino, Ph.D. (*Education*)

Malaquias Montoya, Ph.D. (*Chicano Studies*)

Beatriz Pesquera, Ph.D. (*Chicano Studies, Sociology*)

Vicki L. Ruiz, Ph.D., (*History*)

Adaljiza Sosa-Riddell, Ph.D. (*Chicano Studies*)

Faculty

Angie C. Chabram, Ph.D., Assistant Professor
(*Chicano Studies*)

Yvette Flores-Ortiz, Ph.D., Assistant Professor
(*Chicano Studies*)

Malaquias Montoya, Ph.D., Professor (*Chicano Studies*)

Beatriz Pesquera, Ph.D., Assistant Professor
(*Chicano Studies*)

Refugio I. Rochin, Professor (*Chicano Studies, Agricultural Economics*)

Adaljiza Sosa-Riddell, Ph.D., Lecturer S.O.E.
(*Chicano Studies*)

The Major Program

The major in Chicano studies provides all students with an academic background in the American, Mexican, and Latino cultures. The experience of Chicanos in the United States is analyzed through an interdisciplinary approach focusing upon Chicano history, politics, Spanish language and linguistics, literature, the social sciences, and the arts.

The Program. The major allows for two emphases, one in humanities and the other in sociology. The *humanities* track introduces the student to Chicano history and social sciences, but stresses in-depth knowledge of the Spanish language, linguistics, literature, and Chicano culture. The *humanities* track also develops skills in cross-cultural education and teaching, and provides professional preparation in communications, fine arts, and cultural studies. The *sociology* track combines traditional courses in the social sciences with courses that deal intensively with the contemporary Chicano experience. The sociology emphasis promotes a greater understanding of the social, political, and cultural life of Chicano people, and it provides a solid basis of knowledge for those who wish to work in a cross-cultural setting.

Career Alternatives. A degree in Chicano studies prepares students for careers in bilingual education, community service, and public administration. It is also excellent preparation for graduate or professional school.

A.B. Major Requirements:

Humanities Emphasis:

	UNITS
Preparatory Subject Matter	12-42
Chicano Studies 10	4
Chicano Studies 20	4
Linguistics 1	4
Spanish 1, 2, 3 (or the equivalent)	0-18
Spanish 4 or 7A, 5 or 7B, 28	0-12
Depth Subject Matter	38-40
History 169A, 169B; 166A or 166B	12
Political Science 168	4
Sociology 110 or Spanish 124	4
Spanish 126, 129, 135	12
One course from Linguistics 115, 150 or Education 151	3-4
One course from Spanish 131, 132, 133-4	4
Total Units for the Major	50-82

Sociology Emphasis:

	UNITS
Preparatory Subject Matter	25-37
Chicano Studies 10	4
Chicano Studies 20	4
Linguistics 1	4
Sociology 1, 46A, 46B	13
Spanish 4 or 7A, 5 or 7B, 28	0-12
Depth Subject Matter	43
Chicano Studies 102	4
History 169B	4
Linguistics 115	3
Political Science 168	4
Sociology 110, 140, 165A, 169	16
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, 176, Chicano Studies 132	

Total Units for the Major

Master Adviser. A. Sosa-Riddell.

Major Advisers. *Humanities Emphasis:* A.C. Chabram, M. Montoya, V.L. Ruiz. *Sociology Emphasis:* Y. Flores-Ortiz, B. Pesquera.

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
Political Science 168	4
Sociology 110 or Spanish 124	4
Two elective courses to be chosen from Chicano Studies 102, 132, Education 151, History 169A or 169B (not to duplicate one of the above), Spanish 126A, 126B, or 126C	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.

70. Survey of Chicano Art (4) Montoya

Lecture—4 hours. Survey of contemporary Chicano art in context of the social turmoil from which it springs. Includes political use of the poster and the mural, the influence of the Mexican mural and graphic movement, and social responsibility of the artist.

73. Chicano Art Expression Through Silk-Screen (4) I. Montoya

Studio—8 hours; laboratory—4 hours. Introductory level studio course using silkscreen and basic printing techniques to explore and develop images of Chicano cultural themes and expressions. Students will experiment with images and symbols from their immediate environment/culture. Integrated approach to Chicano philosophy of art.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

102. Chicanas in Contemporary Society (4) II. Pesquera

Lecture—3 hours; term paper. Prerequisite: course

*Course not offered this academic year.

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.

121. Chicano Community Mental Health (4) I. Flores-Ortiz

Lecture—3 hours; term paper. Prerequisite: course 10 or 20. Mental health needs, problems, and service utilization patterns of Chicanos/Latinos will be analyzed. An analysis of social service policy, and the economic context of mental health programs.

130. United States-Mexican Border Relations (4) III. Riddell

Lecture—3 hours; term paper. Prerequisite: upper division standing. Theories of U.S.-Mexican border relations, with an overview of the political, economic, and social relationships and an in-depth analysis of immigration issues, border industrialization, women's organizations, economic crises, and legal issues.

132. Political Economy of Chicano Communities (4) III. Riddell

Lecture—3 hours; term paper. Prerequisite: upper division standing; 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Political Science 1 or 2.

194HA-HB-HC. Senior Honors Research Project (2-5) I, II, III. The Staff

Independent study—6-15 hours. Prerequisite: senior standing in Chicano Studies major. Student is required to read, research, and write Honors Thesis on Chicano Studies topics. (Deferred grading only, pending completion of sequence)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

Child Development (A Graduate Group)

Rosemarie Kraft, Ph.D., Chairperson of the Group
Group Office, 103 AOB 4 (916-752-1926)

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 leading to a M.S. degree. The aim of the program is to provide students with an opportunity to pursue a coordinated course of postgraduate study in the field of child development which cuts across departmental boundaries. Opportunities are provided to work with children and adults in the community including the University's Early Childhood Laboratory. Recipients of the degree gain sufficient background in the biological and social sciences to engage in professions dealing with children, obtain positions in teaching or research settings, or pursue further study leading to a doctorate in child development or related fields.

Admission applications must be in by May 1.

Graduate Adviser. Contact Group Office.

Chinese

See Chinese and Japanese (below); Asian American Studies; and East Asian Studies

Chinese and Japanese

(College of Letters and Science)

Robert Borgen, Ph.D., Program Director
Program Office, TB 134 (916-752-4995)

Committee in Charge

Robert Borgen, Ph.D. (*Chinese and Japanese*)
Chia-ning Chang, Ph.D. (*Chinese and Japanese*)
Donald Gibbs, Ph.D. (*Chinese and Japanese*)
Susan Griswold, Ph.D. (*Chinese and Japanese*)
Mau-sang Ng, Ph.D. (*Chinese and Japanese*)
Benjamin E. Wallacker, Ph.D. (*Chinese and Japanese*)

Michelle Yeh, Ph.D. (*Chinese and Japanese*)

Faculty

Robert Borgen, Ph.D., Associate Professor
Chia-ning Chang, Ph.D., Assistant Professor
Donald Gibbs, Ph.D., Associate Professor
Susan Griswold, Ph.D., Assistant Professor
Key H. Kim, Ph.D., Professor Emeritus
Mau-sang Ng, Ph.D., Associate Professor
Benjamin E. Wallacker, Ph.D., Professor
Michelle Yeh, Ph.D., Associate Professor

Related Courses. See East Asian Studies course listing.

The Minor Program

Minors are offered in Chinese and Japanese for students wishing to follow a formally recognized program of study in those languages and their literatures.

Minor Program Requirements:

	UNITS
Chinese.....	20
Japanese.....	20

All upper division courses, including both language courses and literature in translation courses, may be used to meet this requirement. One approved lower division course (Chinese 10, 11; Japanese 10, 15, 25) may also be used. In addition, students must demonstrate their language proficiency, normally through completion of Chinese 111 or Japanese 111. For details, consult the undergraduate advisers.

Placement. Chinese 1 and Japanese 1 are intended for beginning students with no prior knowledge of those languages. Students who do have some knowledge but wish to improve their skills should meet with one of the advisers to discuss appropriate placement.

Student Advisers. C.N. Chang (*Japanese*), D Gibbs (*Chinese*)

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.

Courses in Chinese

Lower Division Courses

1. Elementary Chinese (5) I. The Staff
Lecture/discussion—5 hours. Introduction to Chinese grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed

Chinese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Modern Chinese (10) II. The Staff

Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

2. Elementary Chinese (5) II. The Staff
Lecture-discussion—5 hours. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Chinese (5) III. The Staff
Lecture-discussion—5 hours. Prerequisite: course 2. 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 Chinese (5) I. The Staff
Lecture/discussion—5 hours. Prerequisite: course 3 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural context, based on language skills developed in course 3.

5. Intermediate Chinese (5) II. The Staff
Lecture/discussion—5 hours. Prerequisite: course 4 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural context, based on language skills developed in course 4.

6. Intermediate Chinese (5) III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 5 or the equivalent. Intermediate-level training in spoken and written Chinese in cultural context, based on language skills developed in course 5.

6A. Situational Chinese (2) I, III. The Staff
Discussion—2 hours. Prerequisite: course 6 (may be taken concurrently.) Instructor and students create a specific social situation and establish roles for student-participants. Using techniques of drama and oral repetition, students develop spoken fluency and appropriateness of expression as skills requisite to internships and study in China.

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. Wallacker
Lecture—1 hour; discussion—1 hour. Selected readings in English translations. (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 Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

104. Twentieth-century Chinese Fiction (In English) (4) 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 alternate years.

106. Chinese Poetry (In English) (4) III. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: History 9A or any course on traditional China recommended. Organized topically and chronologically, the lyric tradition is explored from the dawn of folk songs down to modern expressions of social protest. Topics include friendship, love, oppression, war, parting, death, ecstasy and beauty. All readings are in English.

107. Traditional Chinese Fiction (In English) (4) I. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or a course in Chinese history. English-language course studying the dawn of Chinese fiction and its development down to modern times. Combines survey history with close reading of representative works such as *The Story of the Stone* and famous Ming-Qing short stories.

108. Poetry of China and Japan (In English) (4) II. Yeh
Lecture—3 hours; discussion—1 hour. A comparative approach to Chinese and Japanese poetry, examining poetic practice in the two cultures; includes a general outline of the two traditions, plus study of poetic forms, techniques, and distinct treatments of universal themes: love, nature, war, etc. Offered in alternate years. (Same course as Japanese 108.)

109A-I. Topics in Chinese Literature (In English) (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: depending on topic, course 10, 11, 104, 106, 107, or a course in Chinese history. Topics in Chinese literature may include: A) crime and punishment; B) love in poetry; C) women writers; D) the knight-errant; E) the city in fiction; F) the recluse; G) the literature of twentieth-century Taiwan; H) popular literature; I) the scholar and the courtesan. Offered in alternate years.

111. Modern Chinese: Reading and Discussion (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or the equivalent. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in courses 1 through 6.

112. Modern Chinese: Reading and Discussion (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 111. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in course 111.

113. Modern Chinese: Reading and Discussion (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112. Readings in modern Chinese newspaper articles, essays, and short stories, based on language skills developed in course 112.

114. Introduction to Classical Chinese: Confucius (4) I. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Texts from the Confucian canon are read with the assistance of prepared word glossaries so that while learning to read classical Chinese, the students also experience the most influential books in the history of China in their original texts.

115. Introduction to Classical Chinese: Mencius (4) II. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 114. Continues course 114 by reading selections from the text of the Mencius.

116. Introduction to Classical Chinese: Narrative Styles (4) III. Ng
Lecture—3 hours; discussion—1 hour. Prerequisite: course 115. Continues course 115 by reading selections from the Records of the Grand Historian and other early, influential works.

120. Advanced Chinese (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or consent of instructor. Selected readings from all genres to develop advanced skills in reading, writing, aural comprehension, and translation. May be repeated once for credit.

130. Readings in Traditional Chinese Fiction (4) II. Ng
Lecture—1 hour; discussion—3 hours. Prerequisite: course 112 or the equivalent; course 114 recommended. Close reading in Chinese of representative works from the Tang Dynasty (618-907) to modern times. May be repeated once for credit when content varies.

131. Readings in Traditional Chinese Poetry (4) I. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Traditional Chinese poetry from its beginnings to the golden ages of Tang and Song, surveying forms and poets that best reveal the Chinese poetic sensibility and the genius of the language of Chinese poetry.

132. Readings in Modern Chinese Poetry (4) II. Yeh
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Chinese poetry from the Literary Revolution of 1917 to the present, surveying works that embody exciting innovations and reflect the modernity of twentieth-century Chinese society and culture.

140. Readings in Classical Chinese (4) I, II, III. Wallacker
Lecture-discussion—3 hours; term paper. Prerequisite: consent of instructor. Study and philological analysis of selected texts from the first millennium of Imperial China. May be repeated twice for credit.

160. The Chinese Language (4) III. Wallacker
Lecture-discussion—4 hours. Prerequisite: course 6 (may be taken concurrently); Linguistics 1 recommended. The Chinese language viewed in its linguistic context, synchronically and diachronically. Historical phonology, classical and literary language, rise of written vernacular, descriptive grammar of modern standard Chinese, dialectal variation, and sociolinguistic factors.

192. Chinese Internship (1-12) I, II, III. The Staff
Internship—3-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in the Chinese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

197. Tutoring In Chinese (1-5) I, II, III. The Staff
Tutoring—1-5 hours. Prerequisite: consent of Program chairperson. Leading of small voluntary discussion groups affiliated with one of the Program's regular courses. May be repeated for credit, but only 2 units may be applied to the minor. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Course
299. Research (1-12) I, II, III. The Staff (S/U grading only.)

Courses in Japanese

Lower Division Courses

1. Elementary Japanese (5) I. The Staff
Lecture/discussion—5 hours. Introduction to spoken and written Japanese in cultural context, with emphasis on communication. (Students who have successfully completed Japanese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Japanese (10) II. The Staff
Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

2. Elementary Japanese (5) II. The Staff
Lecture/discussion—5 hours. Prerequisite: course 1 or the equivalent. Continuation of training in basic spoken and written skills.

3. Elementary Japanese (5) III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 2 or the equivalent. Continuation of training in basic spoken and written skills.

4. Intermediate Japanese (5) I. The Staff
Lecture/discussion—5 hours. Prerequisite: course 3 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 3.

5. Intermediate Japanese (5) II. The Staff
Lecture/discussion—5 hours. Prerequisite: course 4 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 4.

6. Intermediate Japanese (5) III. The Staff
Lecture/discussion—5 hours. Prerequisite: successful completion of course 5 or the equivalent. Intermediate-level training in spoken and written Japanese in cultural context, based on language skills developed in course 5.

10. Masterworks of Japanese Literature (In English) (3) III. Fahy
Lecture—2 hours; discussion—1 hour. An introduction to Japanese literature: readings and discussion in English of important works from earliest times to the present.

15. Introduction to Traditional Japanese Culture (3) II. Borgen
Lecture—2 hours; discussion—1 hour. General introduction to Japanese culture from its beginnings through 1850, focusing on religion, thought, and the arts (visual and performing). Indigenous traditions and the assimilation of foreign influences will be discussed. Readings and discussions in English.

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 alternate years.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

101. Japanese Literature in Translation: The Early Period (4) I. Borgen
Lecture—3 hours; discussion—1 hour. Early Japanese literature from the Nara to the end of the Heian period through a broad survey of the major literary genres such as lyric poetry, court diaries, prose narratives, poem-tales, and classical Chinese writings.

102. Japanese Literature in Translation: The Middle Period (4) II. Griswold
Lecture—3 hours; discussion—1 hour. The major literary genres from the twelfth century to the second half of the nineteenth century including poetry, *renga*, military chronicles, *no* drama, Buddhist literature, *haiku*, *haibun*, *kabuki*, *buraku*, plays and Edo prose narratives.

103. Japanese Literature in Translation: The Modern Period (4) III. Chang
Lecture—3 hours; discussion—1 hour. Modern Japanese literature from the 1870s to the 1970s. Sur-

veys representative literary works and ideas against the social and intellectual background of the Meiji, Taisho, and Showa periods.

105. Modern Japanese Literature: Hero and Anti-hero (3) II. Chang

Lecture-discussion—3 hours. The ways in which representative heroes and anti-heroes in modern Japanese literature perceive, confront, struggle with, and resolve a wide array of social, moral, and intellectual problems in their times. Lectures, discussions, and readings in English. Offered in alternate years.

106. Japanese Culture Through Films (3) II. Chang
Lecture-discussion—3 hours. Aspects of Japanese cultural expression about love, the supernatural, and the family; perceptions of childhood, youth, and death as revealed in internationally-acclaimed films by Kurosawa, Ozu, Kobayashi, Itami, and Morita. Lectures, discussions, and readings in English. Films with English subtitles. Offered in alternate years.

108. Poetry of China and Japan (In English) (4) II. Borgen

Lecture—3 hours; discussion—1 hour. A comparative approach to Chinese and Japanese poetry, examining poetic practice in the two cultures; includes a general outline of the two traditions, plus study of poetic forms, techniques, and distinct treatments of universal themes: love, nature, war, etc. Offered in alternate years. (Same course as Chinese 108.)

111. Modern Japanese: Reading and Discussion (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6. Readings in modern Japanese short stories, newspaper articles, and essays; conversation practice based on these readings.

112. Modern Japanese: Reading and Discussion (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 111. Continuation of course 111.

113. Modern Japanese: Reading and Discussion (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 112. Continuation of course 112.

114A. Spoken Japanese (2) I. The Staff
Discussion—2 hours. Prerequisite: course 6 or the equivalent. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

114B. Spoken Japanese (2) II. The Staff
Discussion—2 hours. Prerequisite: course 114A or consent of instructor. Continuation of course 114A. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

114C. Spoken Japanese (2) III. The Staff
Discussion—2 hours. Prerequisite: course 114B or consent of instructor. Continuation of course 114B. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

115. Japanese Composition (2) I. The Staff
Lecture—2 hours. Prerequisite: course 6 or consent of instructor. Development of skills in the techniques of writing Japanese. Practice in short essay writing with an aim toward mastery of the vocabulary and syntax of written style Japanese.

131. Readings in Modern Japanese Literature: 1920-1945 (4) III. Chang

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Fourth-year level reading of representative works of modern Japanese literature including short stories, novellas, diaries, memoirs, poetry and excerpts from novels and plays from 1920 through the militaristic era, to the end of the war years in 1945.

132. Readings in Modern Japanese Literature: 1945-1970 (4) II. Chang

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Continuation of course 131, but may be taken independently. Covers selected texts from the immediate post-war years beginning in 1945 down to 1970 and the post-war recovery.

133. Readings in Modern Japanese Literature: 1970 to Present (4) I. Griswold

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Continuation of course 132, but may be taken independently. Covers selected texts from 1970 to the present. Offered in alternate years.

134. Readings in the Humanities: Traditional Culture (4) II. Borgen

Lecture—3 hours; discussion—1 hour or term paper. Prerequisite: course 113. Fourth-year level reading of modern works by major specialists on traditional Japanese culture: history, religion, thought, art, international relations, and literary history and criticism. Focus is equally on developing reading skills and learning about Japanese culture.

135. Readings in the Humanities: The Post-1945 Period (4) I. Chang

Lecture—3 hours; term paper. Prerequisite: course 113. 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

136. Readings in Newspapers and Magazines (4) III. Griswold

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Fourth-year level reading of newspaper and magazine reports, articles, and editorials on domestic and international affairs relating to contemporary Japan. Offered in alternate years.

192. Japanese Internship (1-12) I, II, III. The Staff
Internship—3-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in Japanese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

197T. Tutoring in Japanese (1-5) I, II, III. The Staff
Tutoring—1-5 hours. Prerequisite: consent of Program chairperson. Leading of small voluntary discussion groups affiliated with one of the Program's regular courses. May be repeated for credit, but only 2 units may be applied to the minor. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Introduction to Classical Japanese (4) I. Borgen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or the equivalent. Introduction to essential grammatical structure of classical Japanese using selections from classical Japanese prose and poetry.

202. Introduction to Classical Japanese (4) II. Borgen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 201. Readings of relatively easy texts of classical Japanese poetry and prose assisted by annotations written in modern Japanese.

203. Introduction to Classical Japanese (4) III. Griswold

Lecture—3 hours; discussion—1 hour. Prerequisite: course 202. Readings of classical and pre-modern Japanese prose and poetry beginning with late Heian works and proceeding to Kamakura, Muromachi and later periods. Readings include plays, Edo narratives, classical Chinese text and early Meiji writings.

291. Seminar in Modern Japanese Literature: Major Writers (4) III. Chang

Seminar—4 hours. Prerequisite: any one of courses 131, 132, 133, 134, 135, or the equivalent. In-depth reading and critical analyses of major works by and critical literature on one or two prominent modern or contemporary writers such as Natsume Soseki, Mori Ogai, Shimazaki Tōson, Akutagawa Ryunosuke,

Tanizaki Junichiro, Abe Kobo and Oe Kenzaburo. Offered in alternate years.

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Classics

(College of Letters and Science)

David A. Traill, Ph.D., Program Director

Department Office (Spanish and Classics), 616
Sproul Hall (916-752-0835)

Faculty

Richard E. Grimm, Ph.D., Associate Professor
Emeritus

Lynn E. Roller, Ph.D., Associate Professor

Wesley E. Thompson, Ph.D., Professor

David A. Traill, Ph.D., Professor

The Major Programs

Classics can be defined broadly or narrowly: broadly, it is the study of all aspects of ancient Greek and Roman life; narrowly, it is the study of the Greek and Latin languages and their literatures. The department offers three majors that reflect these different definitions of the subject: the Classical Civilization major offers a broad interdisciplinary approach to the world of the Greeks and Romans, while the Latin and Greek majors focus on language and literature.

The Program. The core of the major in classical civilization consists of a two-year study of either Latin or Greek during which students learn the rudiments of the language and read three or more major ancient authors in the original language. Students complete the major requirements by selecting about ten courses from a broad range of offerings on different aspects of classical civilization. Latin majors and Greek majors spend a year learning the rudiments of the language, then read a selection (36 units) of major Greek or Latin authors.

Career Opportunities. Majors in classics can make direct use of their knowledge in careers in library science, museum work, or high school teaching, or by going on to graduate work in classics, philosophy, art history, archaeology, history or theology. Students planning to go on to graduate work in classics should bear in mind that good graduate schools look for students who are well prepared in both Latin and Greek and have reading knowledge of French or German. A degree in classics is also an excellent preparation for professional schools; in the past 20 years, all majors in classics from Davis who have sought admission to law or medical school have been accepted.

Classical Civilization

A. B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
Greek 1, 2, 3 or Latin 1, 2, 3 or the equivalent.....	15
Three courses from the following	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) *Philosophy and Political Theory*: Philosophy 143, 161, 162, Political Science 118A, Rhetoric and Communication 110

Total Units for the Major64

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, III. 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, II, III. The Staff

Lecture—3 hours. Origin and development of myths and legends, their place in the religion, literature, and art of Greece and Rome.

15. *Women in Classical Antiquity* (3) III. Allan

Lecture—3 hours. Lives and roles of women in ancient Greece and Rome. Readings from the history, philosophy, medical and legal documents, literature and myth.

17A. *Mediterranean Bronze Age Archaeology* (4)

I. Roller
Lecture—3 hours; term paper. Archeological monuments of the Ancient Near East, including Egypt and Mesopotamia, and of Greece and Crete during the Bronze Age. Special emphasis on the Minoan and Mycenaean civilizations. General Education credit: Civilization and Culture/Introductory.

17B. *Greek Archaeology* (4) II. Roller

Lecture—3 hours; term paper. Archeological monuments of Geometric, Archaic, and Classical Greece, with special emphasis on the development of cities and sanctuaries. General Education credit: Civilization and Culture/Introductory.

*17C. *Later Greek and Roman Archaeology* (4) III.

Roller
Lecture—3 hours; term paper. Archeological monuments of the Greek world after the conquests of Alexander the Great, and the monuments of Rome and the Roman Empire. Offered in alternate years. General Education credit: Civilization and Culture/Introductory.

20. *Pompeii AD 79* (4) III. Traill

Lecture—3 hours; term paper. Roman life in an urban community at the time of the eruption of Vesuvius. Slide presentations of the archeological evidence will be supplemented by selected readings from Petronius' *Satyricon* and other ancient authors. Offered in alternate years. General Education credit: Civilization and Culture/Introductory.

30. *Greek and Latin Elements in English Vocabulary* (3) I, III. The Staff

Lecture—3 hours. Knowledge of Latin and Greek not required. Elements of Greek and Latin vocabulary for increased understanding of English word formation and improved ability to understand and retain unfamiliar words. Emphasis on Greek and Latin elements but other languages not neglected.

*31. *Greek and Latin Elements in Technical Vocabulary* (3) III. The Staff

Lecture—3 hours. Knowledge of Greek and Latin not required. Elements of Greek and Latin vocabulary to increase understanding of English word formation in medical, scientific and technical terminology and improve ability to understand and retain unfamiliar terms.

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 alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Classics 4A or 10.

141. *Greek and Roman Comedy* (4) III. The Staff
Lecture—3 hours; conference—1 hour. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Classics 4A.

*142. *Greek and Roman Novel* (4) I. Traill

Lecture—3 hours; term paper. Examination of the ancient Greek romances and their development into the grotesque realism of Petronius' *Satyricon*, and the religious mysticism of Apuleius' *The Golden Ass*.

143. *Greek Tragedy* (4) I. Allan

Lecture—3 hours; term paper. Prerequisite: course 4A or 10. Reading in English of selected plays of Aeschylus, Sophocles and Euripides. Lectures on

the development and influence of Athenian tragedy. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Classics 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 alternate years.

*175. *Topography and Monuments of Ancient Athens* (4) III. Roller

Lecture/discussion—4 hours. Prerequisite: course 17A-17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in alternate years.

197TC. *Community Tutoring in Classical Languages* (1-5) I, II, III. Grimm

Tutoring—1-5 hours. Prerequisite: consent of instructor. Supervised instruction of Greek or Latin in nearby schools by qualified students in department. May be repeated for credit up to 5 units. (P/NP grading only.)

Graduate Courses

201. *Introduction to Classical Philology* (4) I. Traill
Seminar—3 hours; term paper. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

202. *Homer* (4) II. Roller

Seminar—3 hours; term paper. Readings in the *Iliad* and *Odyssey*: the origins and transmission of the poems.

*203. *Vergil* (4) I. Traill

Seminar—3 hours; term paper. Reading of selected books of the *Bucolics*, *Georgics*, and *Aeneid*. Emphasis will be placed on the study of Vergilian poetic language.

*204. *Greek and Roman Comedy* (4) II. The Staff
Seminar—3 hours; term paper. Historical and critical problems in Aristophanes or New Comedy. May be repeated for credit.

*205. *Latin Lyric and Elegy* (4) I. Traill

Seminar—3 hours; term paper. Critical examination of the works of Catullus, Horace, or Propertius. May be repeated for credit.

*206. *Greek Historiography* (4) III. Thompson
Seminar—3 hours; term paper. Development of historical writing in Greece. May be repeated for credit.

*207. *Greek Drama* (4) II. The Staff

Seminar—3 hours; term paper. Literary and philological analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit.

299. *Research* (1-12) I, II, III. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Greek

Lower Division Courses

1. *Elementary Greek* (5) I. The Staff

Lecture—5 hours. Introduction to the basic grammar and vocabulary of Classical and New Testament Greek. Development of translation skills with emphasis on Greek-English. (Students who have successfully completed Greek 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. *Elementary Greek* (5) II. The Staff

Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

2NT. *Elementary New Testament Greek* (1) II. The Staff

Lecture—1 hour. Prerequisite: course 2 (concurrently). Supplementary study of New Testament Greek.

3. Intermediate Greek (5) III. The Staff

Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Greek authors.

3NT. Elementary New Testament Greek (1) III. The Staff

Lecture—1 hour. Prerequisite: course 3 (concurrently). Supplementary study of New Testament Greek.

98. Directed Group Study (1-5) I, II, III. The Staff (Program Director in Charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses**100. Attic Orators (4) I.** Thompson

Lecture—3 hours; term paper. Prerequisite: course 3.

***101. Plato (4) II.** Grimm

Lecture—3 hours; term paper. Prerequisite: course 3.

***102. Euripides (4) I.** Roller

Lecture—3 hours; term paper. Prerequisite: course 101.

***103A. Homer: Illiad (4) I.** Roller

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. Thompson

Lecture—3 hours; term paper. Prerequisite: course 3.

111. Sophocles (4) II. Traill

Lecture—3 hours; term paper. Prerequisite: course 103.

***112. Aristophanes (4) III.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 103.

***113. Thucydides (4) I.** Thompson

Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

***114. Lyric Poetry (4) III.** Grimm

Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

***115. Aeschylus (4) II.** Grimm

Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

***116. Herodotus (4) I.** Traill

Lecture—3 hours; term paper. Prerequisite: course 103. Offered in alternate years.

198. Directed Group Study (1-5) I, II, III. The Staff (Program Director in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Thompson in charge)

(P/NP grading only.)

Latin**Lower Division Courses****1. Elementary Latin (5) I, II.** 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) III. The Staff

Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

***2X. Intensive Latin (10) III.** The Staff

Lecture—10 hours. Prerequisite: course 1. Intensive course that covers the ground of courses 2 and 3 in a single quarter. Those who have completed course 2 may receive only 5 units for course 2X.

3. Intermediate Latin (5) I, III. The Staff

Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Latin authors.

98. Directed Group Study (1-5) I, II, III. The Staff

(Program Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses**100. Ovid (4) I.** Allan

Lecture—3 hours; paper. Prerequisite: course 3. Translation and discussion of selected readings from the works of Ovid.

***101. Livy (4) II.** Thompson

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***102. Roman Comedy (5) I.** Grimm

Lecture—4 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***103. Vergil: Aeneid (4) I.** Traill

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

104. Sallust (4) II. Thompson

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***105. Catullus (4) I.** Traill

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***106. Horace: Odes and Epodes (4) III.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***108. Horace: Satires and Epistles (4) I.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***109. Roman Elegy (4) III.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

110. Caesar (4) II. The Staff

Lecture—3 hours; substantial paper. Prerequisite: course 3. Translation and discussion of selected readings from Caesar. Grammar review and introduction to Latin prose composition. Offered in alternate years.

***111. Silver Age Latin (4) III.** Thompson

Lecture—3 hours; term paper. Prerequisite: course 3. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in alternate years.

***112. Cicero: Political Writings (4) II.** Thompson

Recitation—3 hours; term paper. Prerequisite: course 3.

***114. Cicero: Philosophical Works (4) II.**

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***115. Lucretius (4) III.** Grimm

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

***116. Vergil: Eclogues and Georgics. (4) III.**

Lecture—3 hours; term paper. Prerequisite: course 3. Offered in alternate years.

121. Prose Composition (5) I. Traill

Lecture—4 hours; term paper.

125. Medieval Latin (4) III. Traill

Lecture—3 hours; term paper. Prerequisite: course 3 and two upper division courses in Latin. Selected readings from the Vulgate and various medieval authors provide an introduction to the developments in the Latin Language and literature from the fourth to the fifteenth centuries. Offered in alternate years.

198. Directed Group Study (1-5) I, II, III. The Staff (Program Director in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Program Director in charge)

(P/NP grading only.)

Clinical Nutrition and Metabolism

See Internal Medicine in Medicine, School of

*Course not offered this academic year.

Clinical Pathology

(School of Veterinary Medicine)

Joseph G. Zinkl, D.V.M., Ph.D., Acting Chairperson of the Department

Department Office, 1319 Haring Hall (916-752-0153)

Faculty

Bernard F. Feldman, D.V.M., Ph.D., Professor Emeritus

Nemi C. Jain, M.V.Sc., Ph.D., Professor

Donald E. Jasper, D.V.M., Ph.D., Professor Emeritus

Jiro J. Kaneko, D.V.M., Ph.D., Professor

Joseph G. Zinkl, D.V.M., Ph.D., Professor

Part-Time Clinical Faculty

Robert M. DuFort, D.V.M., Assistant Clinical Professor

Sonja M. Shelly, D.V.M., Assistant Clinical Professor

John W. Switzer, D.V.M., Associate Clinical Professor

Courses in Clinical Pathology

Upper Division Courses**101. Comparative Hematology (2) III.** Kaneko, Jain, Zinkl

Lecture—2 hours. Prerequisite: Biological Sciences 1A, Physiology 110, Biochemistry 101A-101B or Physiological Sciences 101A-101B or consent of instructor. Principles, interpretation, and applications of clinical hematology; comparative blood cellular morphology and function.

101L. Comparative Hematology Laboratory (2) III.

Kaneko, Zinkl, Jain
Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently) and consent of instructor. Introduction to laboratory methods and procedures of clinical hematology. Limited enrollment.

102. Clinical Biochemistry (4) II. Kaneko

Lecture—3 hours; laboratory—2 hours. Prerequisite: Physiology 112, 113; Physiological Sciences 101A-101B or Biochemistry 101A-101B, or consent of instructor. Principles and methods of clinical biochemistry; determination and interpretation of the biochemical constituents of the blood, urine, and other body fluids.

199. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**204. Normal and Abnormal Bone Marrow Cytology (1) III.** Zinkl

Lecture-laboratory—2 hours. Prerequisite: Veterinary Medicine 435 or course 101. Normal maturation of hematopoietic cells followed by a study of the cytology of blood and bone marrow in selected diseases of domestic animals including infections, anemias, myeloproliferative disorders and leukemias.

205. Physiology and Pathology of Leukocytes (2) III. Jain

Lecture—2 hours. Prerequisite: course 101, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and functions of different leukocytes; physiological, functional, histochemical, and morphological changes in leukocytes in diseases; their role in inflammatory and immunologic processes. Offered in alternate years.

206. Immunohematology (2) III. Jain, MacKenzie

(Medicine), 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 alternate years.

254. Pathogenesis of Infectious Disease (2) III.

Cullor (Pathology)
Lecture—2 hours. Prerequisite: upper division or graduate standing in biology or the medical sci-

ences. Introductory courses in microbiology, immunology, hematology, or consent of instructor. Features of pathogenicity and host defense mechanisms common to infection with bacteria; viruses, fungi, and protozoa are emphasized as well as the important species-related differences. Perinatal immune responses of dam and offspring are also covered. Offered in alternate 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.)

Clinical Psychology

See Medicine, School of

Communication

See Rhetoric and Communication

Community Development (A Graduate Group)

Mark Francis, Chairperson of the Group
Group Office, 103 AOB 4 (Applied Behavioral Sciences), (916-752-1926)

Faculty. The interdisciplinary faculty include those in Anthropology, Asian American Studies, African American Studies, Landscape Architecture, Environmental Design, Geography, Psychology, Sociology, and Women's Studies.

Graduate Study. The Graduate Group in Community Development offers a multidisciplinary program of study which leads to the M.S. degree. The program is designed to prepare students for professional roles as administrators, designers, planners, researchers, or technicians with some emphasis upon rural, non-metropolitan communities and human service organizations. Training in community development is also aimed at preparing individuals to work within government or non-profit organizations in the realm of social and economic change. There is opportunity available for specialization in: (1) community design and planning, (2) 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. Dingemans, I. Fujimoto, M. Kenney, S. McNiel.

Community Health

See Medicine, School of

Community Nutrition

(College of Agricultural and Environmental Sciences)

The Major Program

Community nutrition teaches students the identification of nutrition-related health problems and the biological, behavioral, economic, and sociocultural factors that influence the nutrition of individuals and groups. The aim of community nutrition is to apply this knowledge to the development of programs that improve the nutritional status in the community.

The Program. The community nutrition major is designed for students who seek to combine a foundation in the biological and nutritional sciences with study in the social sciences. All students in the major are required to complete a common core of preparatory and depth subject matter courses. Students select one of three subject matter options emphasizing sociocultural, psychological, or economic aspects of food, diet, and nutrition, and an additional area of concentration in consultation with the adviser.

Career Alternatives. The community nutrition major prepares students for jobs in administrative, teaching, research, or public health/public service positions or for graduate or professional training in nutrition and other health sciences. Students who complete the academic requirements for an internship in dietetics are also qualified for careers in dietetics, following completion of an internship.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	49-50
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Computer science (Agricultural Science and Management 21 or Sociology 40).....	2-3
Cultural food habits (Nutrition 20).....	4
Cultural social science (Anthropology 2, Geography 2, or Sociology 3).....	4
Social research methods (Sociology 46A or Psychology 41).....	4
Statistics (Sociology 46B or Statistics 13).....	4
Breadth/General Education	6-24
Satisfaction of General Education requirement.....	6-24
(Note that some of the Option Subject Matter may meet General Education requirements)	
Depth Subject Matter	52-53
Biochemistry 101A-101B or Physiological Sciences 101A-101B.....	6-7
Food Science and Technology 100A, 100B, 101A, 101B.....	10
Nutrition 110, 111, 112, 113, 116A, 116B, 118, 120, 190.....	27
Nutrition 192.....	2
Physiology 110, 110L.....	7
Option Subject Matter	28-32
Course work chosen from one of the following three options in consultation with adviser.....	18-20
Additional units in a related social or health science chosen in consultation with adviser.....	10-12
(May include a minor program in fields such as physical education, environmental toxicology, community development, statistics or the social sciences.)	

Behavioral-Psychological Option

Psychology 1, Education 110 or Psychology 130
Psychology 112 or Human Development 100A or 100B
Psychology 115 or Human Development 100C
Psychology 108, 129, 145, 165, 168, 180A, 180B, 180C
Applied Behavioral Sciences 173, 178
Consumer Science 100
Food Science and Technology 107, 117
Sociology 154
Anthropology 129, 130
Rhetoric and Communication 115

Economics and International Development Option

International Agricultural Development 10
Economics 1A, 1B
Mathematics 16A
Agricultural Economics 100A, 100B, 120, 130, 141
International Agricultural Development 103, 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
Afro-American Studies 100
Applied Behavioral Sciences 2
Rhetoric and Communication 115
Regional courses, choose 8 units from one of the following four areas (alternative courses may be selected in consultation with the adviser)
North America: Anthropology 141A, 141C, 176, Geography 121, History 169A, 169B, Sociology 143A, 143B
Central and South America: Geography 122A, 122B, History 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168
Africa: Anthropology 140A, 140B, Geography 125A, 125B, History 115A, 115B, 115C
Asia: Anthropology 142, 147, 148, 149, Geography 124, 127, History 137A, 137B, 137C, 138, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 195

Additional Recommended Courses

Applied Behavioral Sciences 151, 152, Community Health 101, 160, 180, 194, Environmental Studies 126, Nutrition 114, 116AL, 116BL, 117, 129, 199, 219A, 219B, Sociology 106

Unrestricted Electives.....**13-38**

Total Units for Degree.....**180**

Major Adviser. K.G. Dewey (*Nutrition*).

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

Internship. To fulfill the academic requirements for an internship in Dietetics, the following courses must be included: Economics 1B, Agricultural Economics 112, Food Service Management 120, 120L, 121, 122, 123, Applied Behavioral Sciences 173 or Education 110, Psychology 1, Nutrition 116AI-116BL, and Rhetoric and Communication 1. Consult the Advising Center prior to the first quarter of the junior year for information on procedures.

Graduate Study. For information on graduate study, see the Graduate Division section in this catalog.

Comparative Literature

(College of Letters and Science)

Robert M. Torrance, Program Director

Program Office, 922 Sproul Hall (916-752-9934)

Committee in Charge

Samuel G. Armistead, Ph.D. (*Comparative Literature, Spanish*)

Ruby Cohn, Ph.D. (*Comparative Literature, Dramatic Art*)

Gail Finney, Ph.D. (*Comparative Literature, German*)

Michele Hannoosh, Ph.D. (*Comparative Literature, French*)

Roland W. Hoermann, Ph.D. (*Comparative Literature, German*)

Manfred Kusch, Ph.D. (*Comparative Literature, French*)

Karl Lokke, Ph.D. (*Comparative Literature, English*)

Robert M. Torrance, Ph.D. (*Comparative Literature*)

Marian B. Ury, Ph.D. (*Comparative Literature*)

Faculty

Samuel G. Armistead, Ph.D., Professor
(*Comparative Literature, Spanish*)

Marc El Blanchard, Agrégé de Lettres, Professor
(*French, Critical Theory*)

Ruby Cohn, Ph.D., Professor (*Comparative Literature, Dramatic Art*)

Gail Finney, Ph.D., Professor (*Comparative Literature, German*)

Michele Hannoosh, Ph.D., Assistant Professor
(*Comparative Literature, French*)

Roland W. Hoermann, Ph.D., Professor
(*Comparative Literature, German*)

Manfred Kusch, Ph.D., Associate Professor
(*Comparative Literature, French*)

Karl Lokke, Ph.D., Assistant Professor (*Comparative Literature, English*)

Peter M. Schaeffer, Ph.D., Professor (*German*)

Robert M. Torrance, Ph.D., Professor

Marian B. Ury, Ph.D., Professor

The Major Program

Comparative literature encourages students to read, think about, and compare exciting books from different national languages and from different parts of the world. Comparative literature enlarges students' horizons by bridging the divisions between national cultures instead of concentrating on a single tradition.

The Program. Both the major and minor comparative literature programs allow students to combine courses in one or more national literature departments together with courses in comparative literature. 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.

Career Alternatives. Careers directly related to comparative literature include teaching, journalism, publishing, and translating. Because many professional schools consider a literature major an excellent background for their graduate disciplines, comparative literature provides valuable preparation (supplemented with courses outside the major) for careers in business, government, medicine, or law.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter12-42

Comparative Literature 1, 2, 3.....12

Foreign language: sufficient preparation to insure satisfactory performance at the upper division level.....0-30

Depth Subject Matter40

Five upper division courses (including at least three in a language other than English) distributed between the first and second literatures of concentration with the approval of the adviser.....20

Comparative Literature 141.....4

Two additional upper division Comparative Literature courses, including at least one in a major literary period (such as 164A-D), genre (such as 160A-B, 161A-B, or 166A-B), or movement (such as 168A-C or 169).....8

Two additional upper division courses in one or both literatures of concentration or in Comparative Literature, selected with the approval of the adviser.....8

Total Units for the Major52-62

Recommended

Art 10H; Dramatic Art 20; Classics 10; History 4A, 4B, 4C; Philosophy 21, 22, 23.

Major Adviser. The Staff.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Honors Program. Candidates for high or highest honors in Comparative Literature must write a senior thesis under the direction of a faculty member approved by the Program Director. For this purpose, in addition to fulfilling all other major requirements, honors candidates must enroll in 6 units of Comparative Literature 194H during the first two quarters of the senior year. Only students who have attained a cumulative GPA of 3.5 in all courses satisfying the major (except elementary foreign language courses) at the end of the junior year will be eligible for the honors program.

Minor Program Requirements:

The minor in Comparative Literature allows students to combine courses in Comparative Literature with courses in one or two national literatures, including English and foreign literatures in translation. There is no foreign language requirement for the minor.

UNITS

Comparative Literature24

Comparative Literature 1, 2, or 34

At least two upper division Comparative Literature courses (Comparative Literature 141 strongly recommended).....8

Three additional upper division courses in one or two national literatures (including English) or in Comparative Literature..12

Courses should form a coherent program and should be chosen in consultation with, and with the approval of, the adviser.

Minor Adviser. Same as Major Adviser.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Teaching Credential Subject Representative. The Staff. See also the Teacher Education Program.

Graduate Study. Refer to Comparative Literature (A Graduate Group). See also the Graduate Division section in this catalog.

Courses in Comparative Literature

Lower Division Courses

1. 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 *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. The Staff

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, II, III. Bedrosian, 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) II, 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) I, II, III. Reed, 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 (4) II. Hoermann

Lecture/discussion—3 hours; term paper. Prerequisite: English A. A consideration, in literary works from different ages, of visionary and rational variations on the perfection of a lost paradise, Golden Age, or Atlantis—and of the inhuman nightmares that occasionally result from perversions of the utopian dream. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation 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/Tanizaki, O'Neill/Brecht, Lorca/Pirandello; (N) Camus/Sartre, García Márquez/Grass, Borges/Sarraute, Bellow/Nabokov,

Beckett/Pinter, Genet/ Dürrenmatt. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.)

12. Introduction to Women Writers (4) II, III. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: completion of Subject A requirement. Survey of fiction, drama, and poetry by women writers from all continents. Concerns of women compared in light of their varied social and cultural traditions. Students will practice literary analysis of voice, imagery, narrative strategies and diction. General Education credit: Civilization and Culture/Introductory.

***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 alternate 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) I, III. McLean
Lecture/discussion—3 hours; term paper. Examination of the changing relationship between the individual human being and his "natural" environment, whether cultivated or wild, as reflected in literary works from ancient times to the present by such authors as Hesiod, Virgil, Rousseau, Wordsworth, and Thoreau. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

25. Ethnic Minority Writers in World Literature (4) I. Bedrosian
Lecture—3 hours; term paper. Consideration of a broad range of writers who speak from an ethnic perspective different from the nominally or politically dominant culture of their respective countries and who explore the challenges faced by characters significantly affected by their ethnic minority status. General Education credit: Civilization and Culture/Introductory.

***53A. Literature of China and Japan (3) II.** Ury
Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of East Asia with readings from such works as *The Story of the Stone*, *The Peach Blossom Fan*, T'ang and Sung poetry, classical Japanese poetry, drama, and travel diaries, and *The Tale of Genji*.

53B. Literature of India and Southeast Asia (3) II. The Staff
Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of South Asia with readings from such works as the *Mahabharata* and *Ramayana*, *The Cloud Messenger*, *Shakuntala*, *The Little Clay Cart*, and the stories and poems of both ancient and modern India and Southeast Asia.

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, III. Reed, Lokke
Lecture/discussion—3 hours; term paper. An exploration of women's differing views of self and society as revealed in major works by female authors of various times and cultures. Readings, principally of fiction, will include such writers as Lady Murasaki, Mme de Lafayette, and Charlotte Bronte. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

140. Thematic and Structural Study of Literature (4) III. Hannoosh
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 preparation: any course from the GE Literature Preparation List.

***142. Critical Reading and Analysis (4) III.** The Staff (Director in charge)
Lecture-discussion—3 hours; term paper. Prerequisite: consent of instructor. Close reading of selected texts; scrutiny of very limited amount of material, with attention to the problems of texts in translation.

145. Representations of the City (4) I. Hannoosh
Lecture-discussion—3 hours; term paper. Examination of the portrayal of the modern city in 19th and 20th century western literature. Readings include works by Balzac, Dickens, Poe, Baudelaire, Dostoevsky, Whitman, Zola, T.S. Eliot, and William Carlos Williams.

***146. Myth in Literature (4) III.** Schaeffer
Lecture—3 hours; term paper. Prerequisite: course 6 recommended. Comparative study of different versions of one or more central myths, with attention to their cultural settings, artistic and literary forms of representation, as well as to their psychological dimensions.

***153. The Forms of Asian Literature (4) III.** Ury
Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Introduction to distinctive Asian literary forms, such as *haiku*, *noh*, the Chinese novel and tale, through reading of major works. Comparison with Western genres and study of native and Western critical traditions. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from GE Literature Preparation List.

157. War and Peace in Literature (4) II. Blanchard
Lecture/discussion—3 hours; term papers. Prerequisite: course 1, 2, or 3, or consent of instructor. Through study of a few major works from Western and non-Western literature the course seeks to illuminate the way in which literature from Antiquity to the present has dealt with the antinomy peace/war through the ages. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation 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. 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 preparation: any course from the GE Literature Preparation List.

160A. The Modern Novel (4) III. 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 preparation: any course from the GE Literature Preparation 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 preparation: any course from the GE Literature Preparation 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 preparation: any course from the GE Literature Preparation 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 preparation: any course from the GE Literature Preparation List.

163. Biography and Autobiography (4) I. Ury
Lecture/discussion—3 hours; term paper. Portrayals of a human life in biographies and/or autobiographies of different countries and ages. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

164A. The Middle Ages (4) II. 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 preparation: any course from the GE Literature Preparation 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 preparation: any course from the GE Literature Preparation 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

***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 preparation: any course from the GE Literature Preparation 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 preparation: any course from the GE Literature Preparation List.

167. Comparative Study of Major Authors (4) I. Schaeffer
Lecture/discussion—3 hours; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstol, Proust, and Joyce.

168A. Romanticism (4) II. Lokke

Discussion—3 hours; term paper. Prerequisite: any introductory course in literature. Introduction to the Romantic movement with emphasis upon Romantic concepts of the self, irony, love, the imagination and artistic creativity, and the relationship of the individual to nature and society. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

***168B. Realism and Naturalism (4) III.** Finney

Discussion—3 hours; term paper. Prerequisite: consent of instructor. Novels and plays by Dickens, Zola, Flaubert, Dreiser, Ibsen, and Strindberg investigate marriage and adultery, the city and its perils, the hardships of industrialization, the war between the sexes, the New Woman, and other 19th-century themes. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

***169. The Avant-Garde (4) II.** Chon

Lecture/discussion—3 hours; term paper. Studies in movements such as surrealism, expressionism and the absurd. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

***170. The Contemporary Novel (4) II.** Torrance

Lecture—3 hours; term paper. Study of important novels from different parts of the world, including Asia, Africa, Latin America, Europe, and the United States, in the period from the Second World War to the present. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Director in charge)

Independent study—1-5 hours. Prerequisite: open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member approved by the Program Director, leading to a senior honors thesis on a comparative topic. (P/NP grading only.)

197T. Tutoring in Comparative Literature (1-5) 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) II.** Finney

Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language. Introduction to research tools, library resources, and critical concerns of Comparative Literature, with focus on the comparative study of a single work, culminating in a related research project.

***201. Theories of Comparative Literature (4) III.** Torrance

Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language; course 141 or the equivalent recommended. An examination of international theories of literature with reference to language, genre, thematics, social and historical context.

250A. Research in Comparative Literature (4) I, II, III. The Staff (Director in charge)

Individual instruction—1 hour. Prerequisite: course 200. Individually guided research, under the supervision of a faculty member, in a comparative topic cul-

minating 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 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, (916-752-2239)

Group Office, 922 Sproul Hall (916-752-2239)

Faculty. The interdisciplinary faculty include those in Comparative Literature, French, Italian, German, Russian, and English.

Graduate Study. The Comparative Literature Program offers the M.A. and Ph.D. degrees with a strong emphasis on individual research under the supervision of a faculty member. Candidates for the M.A. combine study of Comparative Literature with study of two literatures (one of which may be English or American) in the original languages. Ph.D. candidates, in addition to further research of a comparative nature, study three literatures (one of which may be English and/or American), 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 rec-

ommendation and a sample of recent written work, and it is recommended that students submit their GRE scores.

Graduate Adviser. Michele Hannoosh (*Comparative Literature, French*).

Comparative Pathology (A Graduate Group)

Joseph G. Zink, D.V.M., Ph.D., Chairperson of the Group

Group Office, 1126 Haring Hall (916-752-1385)

Graduate Study. The Graduate Group in Comparative Pathology offers the M.S. and Ph.D. degrees for graduate study in disciplines concerned with disease processes. The focus of the Group is on the study of the causes and nature of disease processes in animals and humans. Major emphasis is on the mechanisms responsible for the development of diseases at the organismal, cellular or subcellular level. To this study is brought a wide array of scientific 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 an especially strong background in basic biomedical sciences.

Beyond core courses selected from disciplines such as anatomy, bacteriology, genetics, immunology, parasitology, pathology, physiology, and virology, course programs are intentionally 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*).

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.

The Program. Students taking this major receive solid grounding in fundamentals of computer languages, operating systems, and the formal mathematical tools required to use the computer in solving complex tasks. Emphasis in the major is on software, although introductory architecture is included. For students interested in the engineering aspects of computer science, see **Engineering: Computer Science**.

Career Alternatives. The computer science program prepares students for advanced work in computer science or in other disciplines requiring advanced knowledge of the use of computers.

B.S. Major Requirements:

Preparatory Subject Matter	48
Computer Science Engineering 30 or 35, 40	8
Electrical and Computer Science Engineering 70	4
Mathematics 21A-21B-21C, 22A-22B	18
Statistics 32	3
One series from the following four	15
(a) Chemistry 1A-1B-1C	
(b) Chemistry 1A-1B and Biological Sciences 1A	
(c) Chemistry 4A-4B-4C	
(d) Physics 9A-9B-9C and Mathematics 22C	

Depth Subject Matter54

Computer science, core courses	25
Computer Science Engineering 100, 110, 120, 122, 140, 150 or Electrical and Computer Science Engineering 182A	
Electrical and Computer Science Engineering 171	

Computer science electives	14
Minimum of 14 units from Computer Science Engineering 142, 152, 160, 165, 168, 170, 172, 175, 199 (maximum 3 units), Electrical and Computer Science Engineering 176, 177, 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 Major102

Major Advisers. M. Archer, P. Linz, R. Olsson (*Computer Science*).

Graduate Study. See the Graduate Division section in this catalog.

Computer Science (A Graduate Group)

Robert M. Keller, Ph.D., Chairperson of the Group
Group Office, 4455 Chemistry Annex (Division of Computer Science) (916-752-7224)

Faculty. Consists primarily of faculty members from the Division of Computer Science, the Department of Electrical Engineering and Computer Science, the Department of Applied Science (Livermore), the Department of Mathematics, and the Graduate School of Management.

Graduate Study. The Graduate Group in Computer Science offers programs of study leading to the M.S. and Ph.D. degrees in Computer Science. Research strengths lie in algorithms, artificial intelligence, computer architecture, computer networks, computer security, computer systems design, database systems, computer graphics, programming languages, operating systems, parallel and distributed processing, performance evaluation, robotics, scientific computation, software engineering, and others.

Preparation. Normal preparation for the program is a bachelor's degree in either computer science or in a closely related field (such as electrical engineering or mathematics), with substantial course work in computer science. Applications are also considered from students with outstanding records in other disciplines. M.S. students may either complete a thesis or

pass written examinations in three areas of specialization as defined by the Graduate Group. Ph.D. candidates must pass preliminary written examinations in three of the following four areas: programming languages/compilers, operating systems, computer science theory, and computer architecture. The candidates must also pass a qualifying oral examination and complete a dissertation demonstrating original research in an area approved by the Graduate Group.

Graduate Advisers. N.S. Matloff, B. Mukherjee, V. Vemuri.

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, Advising Office, University House Annex.

Upper Division Courses

142. Personal Finance (3) I. Shepard; III. B. Butler; Summer Session
Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Agricultural Economics 142.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Current issues in consumer economics and the economics of consumption.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Consumer Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

Consumer food science emphasizes the socioeconomic, cultural, and nutritional aspects of foods as they relate to consumer acceptability and use.

The Program. Students take courses in consumer economics, nutrition, the scientific principles behind food preparation, sensory evaluation (smelling and tasting), food and culture, consumer behavior, and food product development (how new products make it into the marketplace). By working closely with an adviser, a student can develop a program which will satisfy a wide variety of goals, including jobs in

industry, teaching credentials, and graduate study in food science.

Career Alternatives. Graduates in this major are prepared for jobs in food product development, quality assurance, marketing and sensory analysis, extension service, creative writing, and community service. Some jobs include working directly with consumers to determine the sensory characteristics of foods and how they are liked or disliked. Some students obtain the requirements for a teaching credential and teach elementary or high school home economics, while others go on to obtain a master's or Ph.D. in a related area.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement0-8
See College requirement

Preparatory Subject Matter58-59
Biochemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B).....6-7

Biological science (Biological Sciences 1A-1B-1C).....15

Chemistry (Chemistry 1A-1B-1C, 8A-8B).....21

Computer science (Agricultural Science and Management 21).....3

Physics (Physics 5A or 10).....4

Physiology (Physiology 110).....5

Statistics (Agricultural Science and Management 150).....4

Breadth/General Education.....17-29
Satisfaction of General Education requirement to include:

Economics (Economics 1A-1B)10

Depth Subject Matter56
Agricultural economics (Agricultural Economics 112, 141)8

Community Nutrition (Nutrition 118, 20 or 120)7

Consumer Science (Consumer Science 100, 135)6

Food Science and Technology (100A, 100B, 101A, 101B, 104, 107, 111, 128).....24

Human nutrition with laboratory (Nutrition 110, 111, 112 or 113).....11

Restricted Electives20
Food and consumer related courses selected in accordance with student's educational goal with approval of adviser.

Unrestricted Electives8-22
Total Units for the Degree.....180

Recommended
It is recommended that students interested in graduate work take Chemistry 5, English 104, Mathematics 16A-16B-16C and Physics 5A-5B-5C.

Major Adviser. H.G. Schutz (*Textiles and Clothing*).

Advising Center for the major is located in 128 Cruess Hall (916-752-1468).

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 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 Division of Textiles and Clothing Advising Office, 129 Everson Hall.

Lower Division Courses

47. Food Product Development Field Study (1) III. Schutz

Discussion—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. Course given between Winter and Spring Quarters. Advance enrollment with instructor required Winter quarter. (P/NP grading only.)

92. Internship in Consumer Science (1-12) I, II, III. Schutz

Internship—3-36 hours. Prerequisite: consent of instructor. Internship on and off campus in a consumer science related area. (P/NP grading only.)

Upper Division Courses

100. Consumer Behavior (3) I. Schultz

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 preparation: 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.

192. Internship in Consumer Science (1-12) I, II, III. Schutz

Internship—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Internship on and off campus in a consumer science related area. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. Schutz (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. Schutz (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.

299. Research (1-12) I, II, III. Schutz (S/U grading only.)

Consumer Technology

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Agricultural Engineering.

Courses in Consumer Technology

Questions pertaining to the following courses should be directed to the instructor or the Department of Agricultural Engineering, 2030 Balmer 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) I. J. Rumsey

Lecture—1 hour; laboratory—2 hours. Prerequisite: Chemistry 1A and Physics 5A recommended. Experimental comparisons of techniques for creating objects and structures of metal. Physical principles; design considerations; effects of techniques on quality and appearance; bases for self evaluation of skills. Layout, cutting, forming, welding and finishing. (P/NP grading only.)

17. Electrical Appliances and Systems (2) III. Miles
Lecture—1 hour; laboratory—3 hours. Characteristics and principles of electrical appliances and systems for lighting, heating, and power. Principles of electricity; loads, distribution, and control; safety; planning systems and selecting appliances.

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 and operation. Ideal Otto and Diesel cycles. Engine efficiencies and power measurements. Study of valves, fuels, combustion, carburetion and fuel injection, conventional and electronic ignition, starting and charging, cooling, lubricating and emission control systems.

111. Home Design (2) III. Garrett
Lecture—1 hour; discussion—1 hour; two term projects. Study of factors to be considered in planning, buying, or remodeling homes, including location, orientation, layout, traffic patterns, size, aesthetics, facilities, materials, building codes, regulations, safety, and financing.

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.)

Critical Theory

Marc E. Blanchard, Agrégé de Lettres, Program Director (916-752-4787)

Program Office, 511 Sproul Hall, (916-752-5464)

Committee in Charge

Marc E. Blanchard, Ph.D. (*French, Critical Theory*)

Karen P. Ericksen, Ph.D. (*Psychology*)

M. Kay Flavell, Ph.D. (*Humanities Institute, Critical Theory*)

German Gullón, Ph.D. (*Spanish*)

Naomi Janowitz, Ph.D. (*Religious Studies*)

Roland Marchand, Ph.D. (*History*)

Dario Melossi, Ph.D. (*Sociology*)

Judith Newton, Ph.D. (*Women Studies*)

Aram Yengoyan, Ph.D. (*Anthropology*)

Graduate Study. The program in Critical Theory offers study and research leading to the Ph.D. with a *designated emphasis* in Critical Theory. The program provides theoretical emphasis and interdisciplinary perspective to students already preparing for the Ph.D. In one of the eleven participating departments (Anthropology, Comparative Literature, English, French and Italian, German and Russian, History, Music, Philosophy, Psychology, Sociology, and Spanish; other departments are in the process of joining). Students complete all requirements for the Ph.D., including the dissertation, in one of the participating departments. The additional requirements leading to the designated emphasis consist of two core courses (200A, 200B) offered by the program in Critical Theory, two additional graduate courses (one of which may be Critical Theory 201), and a special examination.

Graduate Adviser. Consult Critical Theory Program Office.

Courses in Critical Theory

Graduate Courses

200A. Approaches to Critical Theory (4) I, II. The Staff

Lecture/discussion—4 hours. Prerequisite: graduate standing in a participating program. Investigation into research problems of Critical Theory and a critical examination of various theoretical approaches (e.g., semiotics, hermeneutics, deconstruction, social and cultural critique, feminist theory, psychoanalysis) in an interdisciplinary perspective.

200B. Problems in Critical Theory (4) II. The Staff Seminar—3 hours; discussion—1 hour. Prerequisite: course 200A. Practical application of critical theoretical perspectives to a common problem defined in interdisciplinary terms. Topics will vary.

201. Critical Theory Special Topics (4) III. The Staff Seminar—3 hours; discussion—1 hour. Prerequisite: course 200A. Application of theoretical principles to one specific research topic. Topics will vary.

Dance

See Physical Education

Dermatology

See Medicine, School of

Design

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Environmental Design.

The Major Program

The design program offers a creative, challenging, and flexible approach to the study of design. The philosophy of the program encourages self-direction and creativity, not only in design work but also in planning the overall undergraduate education.

The Program. Basic introductory design courses such as introduction to design, drawing, and media are required of all design majors. Beyond these, students take specialized courses in their area of interest. A student who emphasizes costume design, for example, might have a study plan that includes courses in photographic media, personal adornment, history of costume design, and the upper-division studio costume design series. Textile design students take courses in hand constructed, layered, and loomed textiles, as well as the printed textile design series. Environmental design is an area which includes courses in drafting and perspective, exhibit design, furniture design, and the two-year studio interior design series. These areas are strongly complemented by classes in related design history.

Portfolio. Students will be required to keep a continuing portfolio of their creative work to be evaluated by faculty for the purposes of declaring the major, enrolling in overflow courses, and requesting independent study, internship, or other similar courses.

Internships and Career Alternatives. As part of their preparation, design students are encouraged to become involved in internships in design firms, museums, art galleries, textile galleries, and in interior designers' and architects' offices. Design graduates have gone directly from this program into retail clothing and interior design and architectural firms, exhibit and display work in galleries and museums, and theatrical and textile companies. In addition, students also create their own jobs through freelance and commission work in many related areas.

B.S. Major Requirements:

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	32-34
Art (one course from Art 1A, 1B, 1C or 1D).....	4
Design (Design 1, 2, 3, 11, 12, 13).....	21
Other (two courses from American Studies 10, Anthropology 2, Geology 2, Psychology 1, Sociology 1, 25, Rhetoric and Communication 1, 3).....	7-9
Breadth/General Education	32
Satisfaction of General Education requirement to include 16 units in natural science and/or Nature and Environment and 16 units in social science and/or Contemporary Societies.....	32
Depth Subject 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
Restricted Electives	21
(Courses to be selected with approval of adviser.)	
Unrestricted Electives	25-28
Total Units for the Degree	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. H.B. Olsen (*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 (916-752-1165).

Lower Division Courses

- 1. Introduction to Design (4) I.** Gotelli
Lecture—4 hours. Evolution of 20th-century design emphasizing design elements, materials, principles, and vocabulary.
- 2. Design Methodology (4) III.** The Staff (Olsen in charge)
Lecture—4 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. Fantasy Design (4) II.** Gotelli
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2. Investigation of fantasy as found in the environment. All aspects of design are explored and fantasy is presented as a problem-solving device.
- 11. Drawing Studio (4) I.** The Staff (Olsen in charge)
Studio—8 hours. Prerequisite: course 1 must be taken concurrently; priority enrollment to Design majors. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. May be repeated once with a different instructor (course 1 should not be repeated).
- 12. Media Studio (4) II.** The Staff (Olsen 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 (Olsen in charge).
Studio—8 hours. Prerequisite: course 1 or 2; course 3 must be taken concurrently; priority enrollment to Design majors. Film and video tape for description, simulation, analytical research, and design development.
- 21. Drafting and Perspective (4) I.** Olsen and staff
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.
- 22. Basic Imagery (4) I.** Butler
Studio—8 hours. Prerequisite: courses 11, 12. Presentation of the fundamentals of designed images, combining a theoretical perspective with practice using the components of visual literacy. Specific focus upon (1) abstract structure, (2) symbolism, and (3) representation.
- 23. Personal Adornment (4) I.** Stabb
Studio—8 hours; field trip. Exploration of the human image altered through ornament and its relation to the human structure.
- 24. Hand Constructed Textiles (4) I.** Laky
Studio—8 hours; one or two field trips. Prerequisite: courses 11, 12. Contemporary approach to textile techniques of construction such as netting, plaiting, knotting and basketry.
- 25. Reproduction Graphics (4) II.** The Staff (Olsen in charge)
Studio—8 hours; field trip. Prerequisite: courses 11 or 12, and 13. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations.
- 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 and staff
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) 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 visual merchandising.

126B. Visual Presentation: Exhibition Design (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 the museum and gallery environment.

131. Layered Textiles (4) II. The Staff (Olsen in charge)
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. Prerequisite: course 23 or 24. Foundation course in handwoven textile structure and design, emphasizing yarn identification, basic drafting, basic weaves and their derivatives explored in context of original color effects and yarn combinations.

132B. Loom-Constructed Textile Design (4) II. Shawcroft
Studio—8 hours. Prerequisite: course 132A. Intermediate level study of complex fabric structure with emphasis on pattern in relation to surface, dimension, and material.

***132C. Computer-Aided Textile Design (4) III.**
Studio—8 hours. Prerequisite: course 132B. Micro-computer applications to the structure, design, and weaving of fabrics, emphasizing advanced compositions, drafting, and plotting of multi-dimensional, original weave structures.

133A-133B. Visual Metaphor (4-4) II, III. Butler
Studio—8 hours. Prerequisite: courses 13, 22, 25. Study and practice of image generation and production with emphasis on clarity of visual expression, the perception and use of color, and visual composition in the three-dimensional context.

134A. Fundamentals of Interior Architecture (4) I. Harrison and staff (Olsen in charge)
Studio—8 hours. Prerequisite: courses 11, 12, 13, and 21 and junior standing. Introduction to design process through simple space planning problems focused on residential and small commercial installations.

134B. Fundamentals of Interior Architecture (4) II. Berteaux
Studio—8 hours. Prerequisite: course 134A. Problems emphasize energy considerations, structure, building systems, and architectural harmony in the urban environment.

134C. Fundamentals of Interior Architecture (4) III. Harrison and staff (Olsen in charge)
Studio—8 hours. Prerequisite: course 134B. Problems emphasize the design of special and technical environments such as laboratories, medical facilities, and computer installations and environments for the handicapped, aged, and very young.

135. Furniture Design (4) 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 (Olsen 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, 180A, 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—4 hours; field trip. Prerequisite: course 140. History of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects.

144. History of Interior Design (4) III. The Staff (Olsen 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. The Staff (Olsen in charge)
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. Advanced Interior Architecture (4) I. Olsen and staff (Olsen in charge)
Studio—8 hours; field trip. Prerequisite: course 134C and senior standing. Advanced problems in interior architectural design emphasizing re-use of existing buildings. Focus is on commercial and retail environments, code requirements, color and lighting.

180B. Advanced Interior Architecture (4) II. Harrison and staff (Olsen in charge)
Studio—8 hours; field trip. Prerequisite: course 180A. Advanced problems in interior architectural design emphasizing space planning for corporate and institutional environments.

180C. Senior Project in Interior Architecture (4) III. Berteaux
Studio—8 hours; field trip. Prerequisite: course 180B. Design of a complex facility, including the integration of interior design, building structure and building systems.

190. Proseminar (1) II. Harrison
Seminar—1 hour. 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 (Olsen 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 (Olsen in charge)
Internship—3-18 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship, off and on campus, in areas of design including environmental, costume, textile, museum, display and interior design. Enrollment limited to 3 units per quarter or 6 units per summer session. (P/NP grading only.)

197T. Tutoring in Design (1-5) I, II, III. The Staff (Olsen 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 (Olsen in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. Special Study of Advanced Undergraduates (1-5) I, II, III. The Staff (Olsen in charge)
(P/NP grading only.)

Graduate Courses

298. Directed Group Study for Graduate Students (1-5) I, II, III. The Staff (Chairperson in charge)
Studio—variable hours. Prerequisite: consent of instructor. (S/U grading only.)

299. Directed Individual Study for Graduate Students (1-5) I, II, III. The Staff (Chairperson in charge)
Studio—variable hours. Prerequisite: consent of instructor. (S/U grading only.)

Development, Resource, and Consumer Economics

See Agricultural and Managerial Economics

Dietetics

(College of Agricultural and Environmental Sciences)

The Major Program

The dietetics major provides students with training in normal and therapeutic nutrition, biological and social sciences, food science, communication, and management. This major fulfills the academic requirements for admission into a dietetics internship or the equivalent which must be completed before qualifying for registration as a dietitian.

The Program. The dietetics major takes the same basic core of nutrition classes as nutrition science majors, but in dietetics there is less emphasis on laboratory aspects of the science courses. Instead,

dietetics majors take additional courses such as education, sociology, communication skills, and food service management to prepare for work with the public. Dietetics students spend the first two years completing preparatory course work in the basic biological sciences, along with several of the social sciences. In the final two years, students take courses in normal and clinical nutrition, food science, biochemistry, and management techniques.

Career Alternatives. The dietetics major qualifies students to apply for the American Dietetics Association "accredited internship," enabling them to become a Registered Dietitian, the professional credential necessary to work in a clinical setting. Once dietitians are registered, they generally seek employment in administrative, therapeutic, teaching, research, or public health/public service positions in clinics, hospitals, schools, or other similar institutions. There is a growing role for dietitians working in settings outside of the traditional hospital (for example, in state and federal nutrition programs, nutrition education, Peace Corps and Cooperative Extension work). Students who complete the undergraduate preparation in dietetics are also qualified to enter graduate programs in dietetics, nutrition science, public health nutrition, and food service management.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College Requirement	
Preparatory Subject Matter	52-53
Biological sciences (Biological Sciences 1A, 1B)	10
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Computer science (Agricultural Science and Management 21 or Computer Science Engineering 10).....	3
Economic principles (Economics 1A or 1B).....	5
Microbiology (Microbiology 102, 102L)	6
Psychology (Psychology 1).....	4
Social science theory (Sociology 1 or 3 or Anthropology 2	4-5
Statistics (Statistics 13)	4
Breadth/General Education	6-24
Satisfaction of General Education requirement	6-24
Depth Subject Matter	71-72
Agricultural Economics 112	4
Applied Behavioral Sciences 173 or Education 110 or 111	4
Biological chemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B).....	6-7
Food Science and Technology 100A, 100B, 101A, 101B	10
Food Service Management 120, 120L, 121, 122, 123	14
Nutrition 110, 111, 113, 116A, 116AL, 116B 116BL, 118, 190.....	26
Physiology (Physiology 110, 110L).....	7
Unrestricted Electives	23-43
Total Units for the Major	180

Major Adviser. J. Prophet (*Nutrition*).

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

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
(916-752-0888)

Faculty

Elizabeth Carlin, M.F.A., Assistant Professor
Ruby Cohn, Ph.D., Professor (*Dramatic Art, Comparative Literature*)
Everard d'Hamoncourt, Ph.D., Professor Emeritus
Robert A. Fahrner, Ph.D., Professor
Ralph Fetterly, M.A., Associate 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
Daniel E. Snyder, Professor
Alan A. Stambusky, Ph.D., Professor
Craig Volk, M.F.A., Assistant Professor
Darrell F. Winn, M.A., Adjunct Lecturer

The Major Program

The Department of Dramatic Art offers students an opportunity to develop their talents and abilities through a broad spectrum of courses combining both artistic and scholarly skills. The dramatic art student is exposed to every phase of theatre: the performing areas such as acting, directing, design, and playwriting; technical practice involving construction and coordination of sets, costumes, and lights; and a firm grounding in theatre history, dramatic literature, and criticism.

Productions and Facilities. Productions each year are separated into three "seasons." The University Theatre Season consists of five major productions of established plays. Five smaller productions of new, student-written plays form Premiere Season, while Studio Season offers three smaller productions of established plays. Also included in the production program are one major presentation of an experimental piece and many class-related projects.

Guest Artists. The department's Granada Artists-in-Residence program brings distinguished British theatre artists to the department each quarter to teach and direct.

Career Alternatives. The various skills involved in a rounded theatre education open doors to many career possibilities. Arts management is a relatively new area calling for people with artistic training. Designers and technicians will find career opportunities in community theatres, amusement parks, museums, lighting firms, the fashion industry, and advertising. Training in acting helps those interested in pursuing law, business, public relations, or public office. And there are always those few who—with talent and luck—succeed as actors, directors, or designers for stage, film, or television.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	22
Dramatic Art 20, 21A, 24, 25	14
Dramatic Art 21B or 27	3-4
Additional units to achieve a total of 22 lower division units in Dramatic Art	4-5
Depth Subject Matter	40
Dramatic Art 124A or 124B, 124C or 124D, 127A, 127B or 160B, 156, 157, 158, 159, 160A	36
A minimum of 4 elective units chosen from the following: Dramatic Art 115, 121A, 121B, 124C, 124D, 126, 150, 153, 155; or, with the adviser's consent, from appropriate literature courses in language and literature departments	4

Additional Requirements

During the undergraduate career majors are to participate in at least eight dramatic productions (exclusive of classroom projects). Participation must include work in acting, scene construction, costume construction, lighting, and stage managing or directing. Majors are also expected to attend theatre performances.

Total Units for the Major62

Minor Program Requirements:

	UNITS
Dramatic Art	20
Dramatic Art 124A, 160A, 156, 157 or 158, 159	20

Major Advisers. E. Carlin, H. Johnson.

Transfer Students. If you are a transfer student you should see the major adviser for an evaluation of your experience.

Teaching Credential Subject Representative. E. Carlin. See also the Teacher Education Program.

Graduate Study. The Department of Dramatic Art offers programs of study and research leading to the M.A., M.F.A. (acting, design, directing, or play writing), and Ph.D. (theatre research) degrees. Detailed information may be obtained by contacting the Graduate Adviser.

Graduate Adviser. W.E. Kleb.

Courses in Dramatic Art

Lower Division Courses

10. Introduction to Acting (3) I, II, III. The Staff
Lecture-discussion—4 hours; term paper. Fundamentals of movement, speech, theatre games, and improvisation. Selected reading and viewing of theatre productions. Intended for students not specializing in Dramatic Art.

***15. The Art of the Cinema (4) II.** The Staff
Lecture—2 hours; discussion—1 hour; film viewing—2 hours. The cinema as an art form; its relation to other arts; its evolution with emphasis on the significant modern contributions.

***15L. Introduction to Filmmaking (2) I.** The Staff
Lecture/discussion—3 hours; film viewing—2 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. Volk
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. Johnson
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. The Staff
Lecture—1 hour; laboratory—2 hours. Understand-

ing and appreciation of the technical principles of dramatic production; basic tools and materials, principles of scene construction: scene painting, costume construction, stage rigging, lighting and sound equipment and control systems.

*27. Fundamentals of Playwriting and Directing (3) I. Kleb

Discussion—2 hours; workshop—2 hours; reading of selected texts in the theory of directing and playwriting. Prerequisite: consent of instructor. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director.

30. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

***115. Advanced Study of Major Film Makers (4) II.** The Staff

Lecture-discussion—3 hours; film viewing—2 hours. Prerequisite: course 15. Analysis of the contribution of some outstanding film creators. Study of diverse aesthetic theories of the cinema and their application to selected films. May be repeated for credit when different film creator studied.

121A. Advanced Acting (4) I. Johnson
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21B and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

121B. Advanced Acting (4) II. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 121A and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

124A. Principles of Theatrical Design: Scenery (4) I. The Staff
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 alternate 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 alternate years.

***153. The American Musical (4) III.** Kleb
Lecture—4 hours. History and development of the American Musical as a unique theatrical form. Offered in alternate years.

155. Black Theatre and Drama (4) III. Johnson
Lecture—4 hours. Black Theatre and drama today: the history, impact and current direction of the work of Blacks in the theatre. Offered in alternate years.

156. Theatre and Drama: Aeschylus to Machiavel- II (4) I. The Staff
Lecture—4 hours. Selected plays and the history of the theatre from ancient Greece through the Italian and Spanish Renaissance. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A or 4B.

157. Theatre and Drama: Shakespeare to Schiller (4) II. The Staff

Lecture—4 hours. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: 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) III. Kleb

Lecture—4 hours. Examination and evaluation of the "New Theatre." Course includes attending theatre events.

160A-160B. Principles of Playwriting (4-4) I-II. Volk, Kleb

Lecture/seminar—4 hours. Prerequisite: two courses in Dramatic Art or related courses in other departments. Analysis of dramatic structure; preparation of scenarios; the composition of plays.

180. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: upper division standing and course 25, or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit.

192. Internship In Dramatic Art (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division or graduate work in dramatic art; upper division course related to the project; consent of instructor and Department Chairperson. Internship outside the academic department enabling students to practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

197T. Tutoring In Dramatic Art (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-5 hours. Prerequisite: upper division or graduate standing with major in dramatic art; consent of department chairperson. Leading of small voluntary groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Methods and Materials In Theatre Research (4) I. The Staff
Seminar—3 hours; term paper. Essential research

tools in theatre and related fields; bibliographies, primary sources; methods of evaluating and presenting evidence; delineating research areas in the field.

211. Advanced Voice and Speech (2) I, II, III. Carlin
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, Carlin

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. The Staff

Seminar—3 hours; term paper. Selected problems in the design of stage scenery and costumes; practice in design. May be repeated for credit.

224C. Advanced Principles and Theories of Theatrical Design (4) III. Snyder

Seminar—3 hours; term paper. Design of a production for three different types of theatres: open stage, arena, and proscenium. May be repeated for credit.

224D. Advanced Principles and Theories of Theatrical Costume Design (4) III. Kress

Seminar—3 hours; research and design projects—30 hours (minimum) total. Prerequisite: course 124D or consent of instructor. Costume design projects emphasizing research, principles, and theories; the planning and presentation of costume renderings, detail accessory sketches, and scale drawings of patterns. Projects from classic theatre, musical comedy, ballet, and opera. Offered in alternate years.

***224E. Advanced Principles and Theories of Theatrical Lighting Design (4) II.** Winn

Seminar—3 hours; laboratory—2 hours. Prerequisite: course 124C, a scenic design course, and consent of instructor. Design concepts, script/score analysis, color, composition and style. Projects presented in studio atmosphere. Also included: renderings, written analyses, and drafted plots. Offered in alternate years.

227. Seminar In Directing Theory: Realism (4) III. Granada

Seminar—3 hours; term project. Modern directing theory as it applies to theatrical realism; development of directorial concepts for productions of selected realistic plays; emphasis on textual analysis. Offered in alternate years.

228. Seminar In Directing Theory: Non-Realism (4) I. Volk

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 alternate years.

229. Special Problems In Directing (5) I, II, III. Carlin, 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. Kleb and staff

Seminar—3 hours; term paper. The theatre of Greece, Rome and Middle Ages; emphasis on relationship of dramas of the period to physical circumstances of production. Course 230A (may be taken separately) includes readings and discussion; 230B emphasizes research culminating in a substantial scholarly paper.

***235A-235B. Renaissance and Baroque Theatre (4-4) II-III.** Fahrner, Sarlós

Seminar—3 hours; term paper. The theatre of Italy, Spain, England, and France, 1500-1660; emphasis on relationship of dramas of the period to physical circumstances of production. Course 235A (may be taken separately) includes readings and discussion; 235B emphasizes research culminating in a scholarly paper.

***240A-240B. Neoclassic and Romantic Theatre (4-4) II-III.** Fahrner, Sarlós

Seminar—3 hours; term paper. The theatre of France, England, Germany, Italy, and America, 1660-1860; emphasis on relationship of dramas of the period to physical circumstances of production. Course 240A (may be taken separately) includes readings and discussion; 240B emphasizes research culminating in a scholarly paper.

***250. Modern Theatre (4) II.** Sarlós

Seminar—3 hours; term paper. The theatre of Europe and America, 1860-1940, with emphasis on the relationship of the dramas of the period to the physical circumstances under which they were produced. Offered in alternate years.

259. Contemporary Theatre (4) I. 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. Volk, Kleb

Seminar—3 hours; term paper. Dramatic structure, character, and dialogue. Advanced projects in playwriting. May be repeated for credit.

265. Theory of Dramatic Art (4) I. Kleb

Seminar—3 hours; term paper. Theory and aesthetic principles of dramatic art as a fine art. Offered in alternate years.

280. Theatre Laboratory (1-12) I, II, III. The Staff

Advanced practice in acting, designing, directing, playwriting, and technical theatre. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Course

413. Stage Make-up (1) II. The Staff
Lecture/laboratory—2 hours. Prerequisite: consent of instructor. Approved for graduate degree credit. Lectures, demonstrations, and practical work in aspects of theatrical make-up.

Earth Sciences and Resources (A Graduate Group)

Students admitted into the Earth Sciences and Resources Graduate Group before June 30, 1990 will be allowed to complete their degree in this subject.

New students however, should see the Hydrologic Sciences Graduate Group section in this catalog.

Information. 113 Veihmeyer Hall (916-752-3243/0453)

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. (S/U grading only.)

201. Earth Science and Resources (3) II. Moores (Geology)

Seminar—3 hours. Prerequisite: Physics 9B, 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.

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)

Susan Mann, Ph.D., Program Director

Program Office, 922 Sproul Hall (916-752-1219)

Faculty

Robert Borgen, Ph.D. Associate Professor (*Chinese and Japanese*)

Chia-ning Chang, Ph.D. Assistant Professor (*Chinese and Japanese*)

Mary H. Fong, Ph.D., Professor (*Art and Art History*)

Donald Gibbs, Ph.D., Associate Professor (*Chinese and Japanese*)

Susan Griswold, Ph.D., Assistant Professor (*Chinese and Japanese*)

Gary G. Hamilton, Ph.D., Professor (*Sociology*)

Joyce K. Kallgren, Ph.D. (*Political Science*)

Earl Kinmonth, Ph.D., Professor (*History*)

Whalen W. Lai, Ph.D. Professor (*Religious Studies*)

Kwang-ching Liu, Ph.D., Professor (*History*)

Susan Mann, Ph.D. Professor (*History*)

Mau-sang Ng, Ph.D., Associate Professor (*Chinese and Japanese*)

Don C. Price, Ph.D., Professor (*History*)

G. William Skinner, Ph.D. Professor (*Anthropology*)

Janet S. Smith, Ph.D., Associate Professor (*Anthropology*)

Marian Ury, Ph.D., Professor (*Comparative Literature*)

Benjamin E. Wallacker, Ph.D. Professor (*Chinese and Japanese*)

Michelle Yeh, Ph.D., Associate Professor (*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 that combine sustained work in an East Asian language with courses on East Asian countries.

The Program. The program offers core courses in East Asian history, humanities, social sciences, and languages. After taking the core courses in conjunction with two years or more of either Chinese or Japanese language study, the student chooses additional courses focusing on a special field of interest, such as anthropology or history. Since six quarters of language work are required, students normally should apply to the East Asian studies program no later than their sophomore year.

Career Alternatives. The program provides preparation either for a career that involves working with East Asian affairs and people (e.g., journalism, business, government service, teaching, and counseling), or as preparation for graduate studies in the East Asian field.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter38-39

History 9A, 9B.....8

One course from Art 1D, Chinese 10, 11, Comparative Literature 53A, History 90A, Japanese 10, 25, Religious Studies 70, 75.....3-4

Two years (or the equivalent) of Chinese or Japanese language study (Chinese 1-2-3-4-5-6; Japanese 1-2-3-4-5-6)27

Depth Subject Matter36

Must include at least 8 units of core courses from each of the following categories: history, social science, and humanities. Core courses in each category are listed below.

History:

History 190B-190C, 194B-194C

Social Science:

Anthropology 148A, 148B, 149A, 149B

Economics 171

Geography 127

Political Science 148A, 148B

Sociology 147

Humanities

Art 163A, 163B, 163C, 164

Chinese 104, 106, 107

Japanese 101, 102, 103

Religious Studies 172

At least 12 additional units must be selected from the above courses, or from the following: Anthropology 110, 111, 112, 120, 122, 123, 124, 128; Chinese (any upper division course); Economics 115A, 115B, 116, 160A, 160B, 162; Geography 143; History 102G, 102H, 102N, 190A, 191A, 191B, 193, 194A, 194D; Japanese (any upper division course); Linguistics 100; Political Science 127, 133, 138, 145, 148C; Sociology 118, 141, 170, 183. (Or other appropriate courses, including individual and group study courses (198, 199), as approved by the Committee in charge.)

Total Units for the Major74-75

Recommended

Students are strongly urged to take a substantial number of courses in Euro-American civilization as a basis for comparison for a deeper understanding of America's relations with East Asia.

Minor Program Requirements:

Courses taken for the minor are expected to reflect a predominant interest in either China or Japan, but also to provide some exposure to the other of the two countries. All courses counting towards the East Asian Studies major, including individual and group study courses (198, 199), may be used to fulfill the requirements for the minor program, as long as they deal predominantly with China, Japan, or both.

UNITS

East Asian Studies22

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 Japan22

Major Advisers. Consult Program Director.

Courses in East Asian Studies. The following courses count toward the major and are open to students throughout the campus. Refer to departmental listings for course descriptions.

Anthropology

148A. Traditional Chinese Society

148B. Communist Chinese Society

149A. Traditional Japanese Society

149B. Contemporary Japanese Society

Art

1D. Asian Art

163A. Chinese Art

163B. Chinese Painting

163C. Painting in the People's Republic of China

164. The Arts of Japan

Chinese

All courses.

Comparative Literature

53A. Literature of China and Japan

153. Forms of Asian Literature

Economics

171. Economy of East Asia

Geography

127. Contemporary East Asia

History

9A. History of East Asian Civilization (China)

9B. History of East Asian Civilization (Japan)

102G. Undergraduate Proseminar: China to 1800

102H. Undergraduate Proseminar: China since 1800

102N. Undergraduate Proseminar: Japan

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

Japanese

All courses.

Linguistics

100. Languages of Eastern Asia

Political Science

133. The American Role in East Asia

138. International Relations: East Asia

148A. Government and Politics in East Asia:China

148B. Government and Politics in East Asia:Pacific Rim

148C. Government and Politics in East Asia: South-east Asia

Religious Studies

70. Introduction to Buddhism

75. Chinese Philosophy: An Introduction

172. Ch'an (Zen) Buddhism

Sociology

147. Sociological Perspectives on East Asia

Courses in East Asian Studies

Upper Division Courses

113. Cinema and Society in China (4) III. Gibbs

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from History 190C, 193, or consent of instructor. Knowledge of Chinese not required. Viewing and analysis of one Chinese film with English subtitles each week, followed by discussion and short essays. Cinematic technique, social values and film topics from 1930s to today. Not open for credit to students who have completed Chinese 113.

192. East Asian Studies Internship (1-12) I, II, III.

The Staff

Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Work experience in the East Asian Studies field, with analytical term paper on a topic approved by the instructor. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge) Independent study—1-5 hours. Prerequisite: open only to majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis on a topic in East Asian Studies culture, society, or language. (P/NP grading only.)

196A-196B. Honors Seminar (4-4) I-II. The Staff Seminar—2 hours; conference—2 hours. Prerequisite: a GPA of 3.5 in the major, senior standing, and consent of instructor. A two-quarter research project culminating in an Honors thesis. A grade of B or higher must be earned to qualify for the student honors distinction at graduation. Deferred grading only, pending completion of sequence.

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

Ecology (A Graduate Group)

Theodore C. Foin, Ph.D., Chairperson of the Group Group Office, 3122 Wickson Hall (916-752-6752)

Faculty. The Group includes faculty from 43 departments in five schools and colleges, and the Bodega Marine Laboratory.

Graduate Study. The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in several areas of specialization within the spectrum of ecology.

The Ecology program is one of the most diverse on the Davis campus. In order to accommodate varied student interests, the Group depends on close consultation between students and faculty for program development. Several curricular plans are now available in specific areas of emphasis. For details, contact the group office.

Preparation. Appropriate preparation is undergraduate work in any of the biological, social or behavioral, and physical sciences, mathematics or engineering. Applicants will normally be expected to have completed two courses each in introductory biology, general chemistry, physics, mathematics, statistics, and evolution. Applicants in human ecology areas may substitute quantitative social science courses for up to two courses of chemistry or physics. Each of the three broad areas requires certain advanced preparation appropriate to the option. Details may be found in the Group Announcement.

Graduate Adviser. T.C. Foin, J.H. Lieth.

Courses in Ecology

Graduate Courses

200A. Principles and Application of Ecological Theory (4) I. Elliott-Fisk

Lecture—3 hours; discussion—1 hour. Prerequisite: first course in ecology; Statistics 102; Mathematics 16A, 16B. Critical evaluation of ecological theory and applications to ecological management. Historical development of ecological theory is emphasized. Critical evaluation of ecological principles pertaining to the structure and dynamic properties of ecological systems, their organization and evolution.

200B. Principles and Application of Ecological Theory (4) II. Elliott-Fisk

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A. Continuation of course 200A. Critical evaluation of theory and application in the areas of ecological adaptation and system plasticity, spatial

and temporal scales, ecological energetics, and system dynamics. Synthesis of ecological theory into testable principles.

203. Physiological Ecology of Animals (3) III. Paterson (Environmental Studies)

Lecture—2 hours; discussion—1 hour. Prerequisite: Zoology 125 or Physiology 110 or the equivalent; elementary calculus. Comparative examination of several animal groups addressing fundamental physiological mechanisms that shape the ecology of the animal group.

204. Population and Community Ecology (4) I. Toft, Schoener, Salt (Zoology)

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125, Mathematics 21A-21B, or consent of instructor; Mathematics 22B strongly recommended. Review of major theoretical concepts of population and community ecology, with emphasis on both the rationale of the theory and its correspondence to natural phenomena.

205. Structure of Ecological Communities (4) II. Quinn (Environmental Studies)

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125 or Botany 117, Genetics 103 or Botany 100 or Zoology 148, and Mathematics 21A-21B; Ecology 204 and Mathematics 22A-22B strongly recommended. Provides entry-level graduate students and advanced undergraduates an introduction to literature and contemporary research into processes structuring ecological communities. Particular emphasis placed on ecological phenomena with a significant spatial component, e.g., gene flow, colonization, and extinction.

206. Concepts and Methods in Plant Community Ecology (4) I. Rejmanek (Botany), Barbour (Botany), Menke (Agronomy)

Lecture—3 hours; laboratory—4 hours. Prerequisite: Introductory courses in statistics and plant ecology; consent of instructor. Principles and techniques of vegetation analysis, including structure, composition, and dynamics. Emphasis given to sampling procedures, association analysis, ordination, processes and mechanisms of succession, and classification. Most techniques are demonstrated or conducted during field trips and laboratories. Offered in alternate years.

207. Plant Population Biology (3) II. Rice (Agronomy), Jain (Agronomy)

Lecture—2 hours; laboratory-discussion—1 hour. Prerequisite: advanced undergraduate ecology course (e.g., Environmental Studies 100, Zoology 125, Botany 117, or Entomology 104) and advanced undergraduate course in genetics and/or evolution (e.g., Genetics 100, 103, or Botany 100). Provides entry-level graduate students and advanced undergraduates with an introduction to both theoretical and empirical research in plant population biology. Emphasis will be placed on linking ecological and genetic approaches to plant population biology. Offered in alternate years. (Same course as Agronomy 207.)

210. Advanced Topics in Human Ecology (4) III. Orlove (Environmental Studies)

Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. Course stresses the commonalities that human ecologists have as social scientists who specialize in problems relating human populations and environmental variables. General epistemological issues and theoretical models are reviewed. Similarities and differences of human and biological ecology are examined. Offered in alternate years.

211. Advanced Topics in Cultural Ecology (3) I. Orlove (Environmental Studies)

Lecture—3 hours. Prerequisite: graduate standing. Discussion and evaluation of theories which relate environment, culture and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. Offered in alternate years. (Same course as Anthropology 211.)

212A. Environmental Policy Analysis (4) III.

Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108); course in bureaucratic

policy making (e.g., Environmental Studies 166 or Political Science 181); course in intermediate statistics (e.g., Sociology 106 or Agricultural Economics 106). An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in alternate years. (Same course as Environmental Studies 212A.)

212B. Environmental Policy Analysis: Evaluation (4) I. Schwartz (Environmental Studies)

Lecture—1 hour; discussion—1 hour; seminar—2 hours; independent evaluation project. Prerequisite: Economics 100 or the equivalent; Environmental Studies 168A (or the equivalent course in policy analysis or resource economics); intermediate level statistics (e.g., Sociology 106 or Agricultural Economics 106). Examination of recent research and practice in the evaluation of environmentally related policies, programs and plans. Ex-ante and ex-post evaluation will be studied. Offered in alternate years. (Same course as Environmental Studies 212B.)

*213. Population, Environment, and Social Structure (4) II. The Staff

Seminar—3 hours; term paper. Prerequisite: at least one course in population or human ecology, or in environment and resources. Relationships among population dynamics, resource scarcity and environmental problems, and social structure; focus on demographic content of global ecological models and simulations, ecological content of modern demographic theories, and debates about scarcity, inequality, and social conflict and change. Offered in alternate years.

*221. Chemical Aspects of Ecology (3) I.

Lecture—3 hours. Prerequisite: Chemistry 1A-1B-1C and 8B or 128C (or the equivalent); a course in biological ecology; graduate standing and consent of instructor. A week will be spent on each of nine subjects including chemical ecology of reproduction, nutrition, defense, communication, adaptation, and ecosystem structure and function. Offered in alternate years.

*230. Analysis of a Selected Ecosystem (4) I.

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a particular ecosystem. Recent advances in theory, technique, and basic information are emphasized.

232. Theoretical Ecology (3) III. Hastings (Environmental Studies)

Lecture—3 hours. Prerequisite: courses 204, 205 and Mathematics 22A-22B; or Environmental Studies 100, Environmental Studies 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 alternate years.

290. Seminar in Ecology (1-3) I, II, III. The Staff (Chairperson in charge)

Seminar—1 to 3 hours. Prerequisite: consent of instructor. Topics in biological, human, physical, and chemical ecology. Students are expected to present an oral seminar on a particular aspect of the general topic under consideration. (S/U grading only.)

291. Biological Conservation (3) II. Schonewald-Cox (Environmental Studies)

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Examines characteristics of populations that make them vulnerable to extinction and examines various methods that can be used in the restoration process. Although both plants and animals are of interest, emphasis will be on vertebrates. Offered in alternate years.

296. Topics in Ecology (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: graduate standing in Ecology. (S/U grading only.)

297T. Tutoring in Ecology (1-4) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing in ecology; consent of instructor.

Teaching ecology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Economics

(College of Letters and Science)

Robert Feenstra, Ph.D., Chairperson of the Department

Department Office, 381 Kerr Hall (916-752-0741)

Faculty

Giacomo Bonanno, Ph.D., Associate Professor

Severin Borenstein, Ph.D., Associate Professor

Andrzej Brzeski, Ph.D., Professor

Colin Cameron, Ph.D., Assistant Professor

Gregory Clark, Ph.D., Associate Professor

Robert C. Feenstra, Ph.D., Professor

Bruce Glassburner, Ph.D., Professor Emeritus

W. Eric Gustafson, Ph.D., Senior Lecturer

L. Jay Helms, Ph.D., Associate Professor

Kevin D. Hoover, D.Phil., Assistant Professor

Hironitsu Kaneda, Ph.D., Professor

Tracy R. Lewis, Ph.D., Professor

Peter H. Lindert, Ph.D., Professor

Louis Makowski, Ph.D., Associate Professor

Thomas Mayer, Ph.D., Professor

Julie A. Nelson, Ph.D., Assistant Professor

Alan L. Olmstead, Ph.D., Professor

Arthur M. O'Sullivan, Ph.D., Associate Professor

(Economics, Management)

John E. Roemer, Ph.D., Professor

Kevin D. Salyer, Ph.D., Assistant Professor

Steven M. Sheffrin, Ph.D., Professor

Joaquim Silvestre, Ph.D., Professor

Robert K. Triest, Ph.D., Assistant Professor

Elias H. Tuma, Ph.D., Professor

Gary M. Walton, Ph.D., Professor (Economics,

Management)

Leon L. Wegge, Ph.D., Professor

Wing T. Woo, Ph.D., Assistant Professor

The Major Program

Economics is the study of how individuals, organizations, and societies choose among alternative uses of resources and how these resources are turned into the things people want.

The Program. Economics majors complete an introductory course sequence in economics, in addition to several courses in quantitative methods. Intermediate theory and economic history are taken on the upper-division level and then students are free to concentrate the remainder of their units in various areas of interest including more courses in economic theory or history, international economics, labor, industry, alternative economic systems, economic development, public finance, econometrics, or mathematical economics.

Internships and Career Alternatives. Internships for economics majors have been arranged at banks, brokerages, other business enterprises, and governmental units. The internships must complement the student's course work. A degree in economics is excellent preparation for students who want to go on to law school, business school, advanced work in economics, or graduate work in international relations. It is also a good background for careers in management and positions with the government.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	22-26
Economics 1A-1B	10

Statistics 13, 32, or 102	3-4
Mathematics 16A-16B-16C or 21A-21B-21C	9-12

Depth Subject Matter

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; 125-130; 125-131; 130-131; 136A-136B; 151A-151B; 160A-160B	8
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Additional economics courses to achieve a minimum of 40 upper division units ... 18

Total Units for the Major62-66

Recommended

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 21A-21B-21C and 22A.

The Economics Department suggests that Economics 100 and 101 be taken as soon as possible after the introductory courses.

Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter. In special cases, the department will accept a limited number of related upper division courses from other departments in satisfaction of the economics upper division course requirements. Approval from a departmental adviser is required in all such cases.

Graduation with High or Highest Honors. To be eligible for departmental recommendation for High or Highest Honors in Economics at graduation, a student must take all upper division courses in Economics for a letter grade, earn at least a 3.5 grade-point average in those courses, and complete at least six units of course work that result in the submission of an Honors project. Consult the College of Letters and Science section of this catalog and contact the Department for more information.

Major Advisers. S. Borenstein, A. Brzeski, C. Cameron, G. Clark, W.E. Gustafson, K.D. Hoover, H. Kaneda, L. Makowski, J. Nelson, K. Salyer, R.K. Triest, E.H. Tuma, W. 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, J. Silvestre, L.L. Wegge.

Courses in Economics

Lower Division Courses

1A. Principles of Microeconomics (5) I. Borenstein, Gustafson; II. Walton; III. Gustafson, Triest

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. Lindert, Sheffrin; III. Tuma

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, III. The Staff

(Chairperson in charge)

Lecture—3 hours; discussion—1 hour. 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. (CAN Bus 2)

11B. Elementary Accounting (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 11A. Continuation of course 11A. (CAN Bus 4)

92. Internship and Field Work (1-12) I, II, III. The Staff

Internship—3-36 hours; term paper. Prerequisite: junior or senior standing; availability of internship position or approved field work project; stock-brokerage interns must have completed 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) II. Silvestre

Lecture—4 hours; discussion—1 hour. Prerequisite: course 1A-1B; Mathematics 16A-16B or Mathematics 21A-21B each with a grade of C- or better. Theory of the consumer and the firm. Markets under perfect and imperfect competition. General Equilibrium and Welfare Economics. Use of calculus concepts and techniques. (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.

103. Economics of Uncertainty and Information (4) I. Bonnano

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M, Mathematics 16A and 16B or Mathematics 21A and 21B. Optimal decisions under uncertainty, expected utility theory, economics of insurance, asymmetric information, signalling in the job market, incentives and Principal-Agent theory, optimal search strategies and the reservation price principle.

***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 preparation: 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) II. Clark

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in Europe from the year 1700 to the present; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

111A. Economic History (4) II. Walton

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in the United States from Colonial times to 1865; reference to other regions in the Western Hemisphere.

111B. Economic History (4) III. Clark

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, or consent of instructor. Survey of economic change in the United States from 1865 to the post World War II era.

115A. Economic Development (4) I. Kaneda; III. Tuma

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B. Covers major issues encountered in emerging from international poverty. Issues include problems of growth and structural change, human welfare, population growth and health, labor markets and internal migration. Important issues of policy concerning international trade and industrialization.

115B. Economic Development (4) II. Kaneda

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A and 1B. Covers major macroeconomic issues of developing countries. Issues include problems in generating capital, conduct of monetary and fiscal policies, foreign aid and investment. Important issues of policy concerning international borrowing and external debt of developing countries.

116. Economic Systems (4) II. Brzeski

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Critical examination of major economic systems; their goals and institutions; capitalism, fascism, and varieties of socialism; problems of economic planning in USSR, India, China, and other industrializing economies.

117. The Soviet Economy (4) III. Brzeski

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of Soviet economic development: economic organization, methods of planning, and performance.

***118. Political Economy of Agrarian Reform (4) 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) II. Roemer

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M). Marxian economic theories, including theories of value, surplus value and exploitation; accumulation, the business cycle and crises; the role of the State and its relation to classes; imperialism. Writings of Marx and economists in the Marxian tradition will be studied.

***120. Economics of War and Peace (4) III. Tuma**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 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.

121A. Industrial Organization (4) I. The Staff

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) II. Borenstein

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economies of regulated industries.

123. Ecology and Economics (4) I. Gustafson

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Economies and populations as self-regulating systems; economic regulation of man's interaction with its environment. Topics: population growth and its economic determinants; optimal rates of use of exhaustible and renewable resources; implications of common property in resources; prospects for agricultural growth.

125. Urban Economics (4) I. Sullivan

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A, 1B, and 100. Explores the market forces behind the development of cities, explaining the existence of cities and the spatial distribution of activity within cities. Explores the effects of policies that address problems such as poverty, inadequate housing, congestion, pollution, inferior education, and crime.

130. Public Microeconomics (4) I. 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) II. Helms

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M. Assessing the economic burden of taxation; equity and efficiency considerations in tax design; structure and economic effects of the U.S. tax system (including personal income tax, corporation income tax, and property tax); tax loopholes; recent developments; tax reform proposals.

***134. Corporation Finance (4) I. The Staff**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 11A; Mathematics 16A; Statistics 13. General background and rationale of corporation; finance as resource allocation over time; decision making under uncertainty and the role of information; capital market and interest rate structure; financial decisions. Students who have completed Agricultural Economics 171A may not receive credit for this course.

135. Money, Banks and Financial Institutions (3) I. Mayer; II. Salyer

Lecture—3 hours. Prerequisite: courses 1A-1B or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy.

136A. Monetary Theory (4) I. Makowski

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. 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) II. Cameron

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 100, 101; Mathematics 16A-16B or 21A; Statistics 13. Introduction of problems of observation, estimation and hypotheses testing in econometrics through the study of the theory and application of lin-

ear regression models, critical evaluation of selected examples of empirical research and exercises in applied economics.

151A. Economics of the Labor Market (4) I. Cameron

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 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.

151B. Economics of Human Resources (4) III. Nelson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 151A. Human resource analysis; introduction to human capital theory and economics of education; the basic theory of wage differentials, including theories of labor market discrimination; income distribution; poverty. Policy issues: negative income tax; manpower training programs; incomes policy.

160A. International Microeconomics (4) I. Feenstra

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 100 or 100M, or consent of instructor. International trade theory: impact of trade on the domestic and world economies; public policy toward external trade. Students who have completed course 162 may receive only 2 units of credit for course 160A.

160B. International Macroeconomics (4) 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) II. Woo; III. Sheffrin

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. International trade and monetary relations, trade policy, exchange rate policy, policies toward international capital migration and investment. Emphasis on current policy issues. Course intended especially for non-majors. Students who have completed course 160A or 160B may not receive credit for this course.

170. Economy of the Middle East (4) I. 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) II. 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-Saharan. Consult department for course scheduling.

***190. Topics in Economics** (4) II, III. The Staff
Lecture-discussion-seminar—4 hours. Selected topics in economic analysis and public policy. Variable content. May be repeated for credit.

192W. Internship in the Davis-in-Washington Program (6-8) I, III. The Staff
Internship—18-24 hours. Prerequisite: Junior or senior standing in Economics; completion of 84 units of credits with a minimum grade-point average of 3.00; admission to the Davis-in-Washington Program. Internship in Washington, DC with associated research project. Students must arrange for a faculty sponsor before embarking on the internship. Maximum of 3 units will count toward satisfying Economics major requirements. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (3-3) I-II-III. The Staff (Lindert in charge)
Independent study—2 hours; seminar—1 hour. 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) I. Roemer
Lecture—4 hours; discussion—1 hour. Prerequisite: graduate standing. Linear and non-linear optimization theory applied to develop the theory of the profit-maximizing firm and the utility-maximizing consumer. (Same course as Agricultural Economics 200A.)

200B. Microeconomic Theory (5) II. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A or consent of instructor. Characteristics of market equilibrium under perfect competition, simple monopoly and monopsony. Emphasis on general equilibrium and welfare economics; the sources of market success and market failure. (Same course as Agricultural Economics 200B.)

200C. Microeconomic Theory (5) III. Makowski
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200B. Uncertainty and information economics. Individual decision making under uncertainty. Introduction to game theory, with emphasis on applications to markets with firms that are imperfect competitors or consumers that are imperfectly informed. (Same course as Agricultural Economics 200C.)

200D. Macroeconomic Theory (5) II. Hoover
Lecture—4 hours; discussion—1 hour. Prerequisite: course 101; Mathematics 21A, 21B, and 21C. Macrostatic theory of income, employment, and prices.

200E. Macroeconomic Theory (4) III. Salyer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200B (may be taken concurrently) and 200D. Macrodynamics theory of income, employment, and prices.

201A. History of Economic Thought (4) III. Wegge
Lecture—3 hours; discussion—1 hour. Economic thought from the classical Greece era to modern times. Offered in alternate years.

***201B. History of Economic Thought II** (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Origins and emergence of modern economic analysis. Offered in alternate years.

203A. Advanced Economic Theory (4) I. Silvestre
Lecture—4 hours. Prerequisite: course 200A, 200B. Advanced topics in general equilibrium theory and welfare economics: existence, determinateness and efficiency; intertemporal economics; uncertainty.

203B. Advanced Economic Theory: Game Theory (4) II. Bonanno
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B, 200C. Covers the most recent developments in game theory, with the focus changing from year to year. Main topics are: refinements of Nash equilibrium, repeated games, evolution, social situations, bounded rationality, and bargaining theory.

203C. Topics in Economic Theory (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B, 200C. Selected topics in contemporary microeconomic theory. May be repeated for credit with the consent of the Graduate Studies Committee.

204. Microeconomic Analysis (5) I. Hazlett (Agricultural Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 (or 100M) or Agricultural Economics 100A-100B; Mathematics 21A, 21B and 21C (or Mathematics 16A, 16B and 16C). Open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Agricultural Economics 204.)

***207. Contemporary Economics Seminar** (3-5) I, II, III. The Staff
Seminar—2 hours and discussion—2 hours (3 units); plus seminar presentation (5 units). Prerequisite: consent of instructor. 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. (SU grading only.) May be repeated for credit.

***209. Economics of Distributive Justice** (4) I. Roemer
Lecture—4 hours. Prerequisite: course 200B. Introduction to social choice theory; envy-free allocations; axiomatic bargaining theory; axiomatic characterizations of resource allocation. Applications to modeling of the distributive theories of political philosophers J. Rawls, R. Dworkin, R. Nozick, and G.A. Cohen.

210A. Economic History (4) II. Clark
Lecture-discussion—4 hours. Economic history of the eastern hemisphere in the modern period. Medieval Europe or other regions may be studied, depending on student interest.

210B. Economic History (4) I. Olmstead
Lecture-discussion—4 hours. The United States from Colonial times to the present. Other areas of the western hemisphere may be studied, according to student interest.

210C. Economic History (4) III. The Staff
Seminar—4 hours. Prerequisite: a graduate course in economic history. Selected topics and issues, emphasis on current research. (Quarter offered to be flexible.)

214. Development Economics (4) I. Jarvis
Lecture—4 hours. Prerequisite: Agricultural Economics 100A, 100B, course 101; Agricultural Economics/Economics 204 and course 160A-160B recommended. Review of the principal theoretical and empirical issues whose analysis has formed development economics. Analysis of economic development theories and development strategies and their application to specific policy issues in developing country contexts. (Same course as Agricultural Economics 214.)

215A. Agriculture and Economic Development (4) I. Taylor
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204 and 214. Agricultural development theory and application. Analysis of rural-urban linkages and their role in economic development, food price policy, and interactions between economic development and the

environment. Analytical focus on household-farm and intersectoral models. (Same course as Agricultural Economics 215A.)

215B. Open Macroeconomics of Development (4) II. Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200A or 204, 200D or 205, and 214 or 215A. Models and policy approaches regarding trade, monetary and fiscal issues, capital flows and debt are discussed in the macroeconomic framework of an open developing country. The basic analytical focus is real exchange rate and its impact on sectoral allocation of resources. (Same course as Agricultural Economics 215B.)

215C. Empirical Approaches to Development Analysis (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 215A, 215B. Extension of development models for policy analysis including Household-Farm models, models of resource allocation under uncertainty, Social Accounting Matrix and Computable General Equilibrium models. Analysis and case studies of methods of project evaluation with and without income-distribution weights. (Same course as Agricultural Economics 215C.)

***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.

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. Borenstein
Lecture—2 hours; seminar—2 hours. Social standards and public policies toward the business sector of the economy.

221C. Topics in Industrial Organization (4) III. The Staff
Lecture—3 hours; seminar—1 hour. Prerequisite: course 221A. Advanced topics in industrial organization and in applied microeconomics. Emphasis on current research. Contents may vary from year to year.

***225. Urban Economics** (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: course 200A or 204. Explains development of cities and land-use patterns within cities. Explores efficiency and equity effects of local spending and taxes. Analysis of urban problems such as transportation (congestion, pollution, mass transit), crime, and inadequate housing.

230A. Public Economics (4) I. Helms
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Measures of deadweight loss and consumer surplus; optimal commodity and income taxation; tax incidence; policy issues in personal taxation, corporate taxation, and social insurance; evaluation of effective tax rates.

230B. Public Economics (4) II. Triest
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Effects of tax policies on economic behavior; production, consumption, savings, investment, and labor supply. Distribution and equity; social welfare evaluation and the measurement of inequity.

***230C. Topics in Public Economics** (4) III. Nelson
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Advanced topics in economics of the public sector, with emphasis on current research. Content may vary from year to year.

235A. Alternative Approaches to Monetary Analysis (4) I. Sheffrin
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200D (may be taken concurrently). Focuses on relation between changes in money supply and

changes in nominal GNP. Also discusses the effect of changes in money supply on interest rates.

235B. Monetary Theory (4) III. 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) II. 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) II. Burt (Agricultural Economics)
Lecture—4 hours; term paper. Prerequisite: Statistics 131B or 130B; Mathematics 22A. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Agricultural Economics 240A.)

240B. Econometric Methods (4) III. Havenner (Agricultural Economics); III. _____ (Agricultural Economics)

Lecture—4 hours. Prerequisite: course 240A. Covers a variety of topics including analysis of variance, pooled time-series, cross-section estimation, seemingly unrelated regression, classical hypothesis tests, and identification and estimation of simultaneous equation models. (Same course as Agricultural Economics 240B.)

240C. Econometric Theory (4) I. Wegge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Finite sampling theory; nonlinear and dynamic econometric models; asymptotic distribution theory. (Same course as Agricultural Economics 240C.)

240D. Topics in Econometrics (4) II. Cameron
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240B. Advanced topics in nonlinear econometric modelling. Contents may vary from year to year. (Same course as Agricultural Economics 240D.)

***250A. Labor Economics (4) II.** 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.

***256. Applied Econometrics (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: master students in agricultural economics or economics, or consent of instructor. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development. (Same course as Agricultural Economics 256.)

260A. International Economics (4) I. Feenstra
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions.

260B. International Economics (4) II. Woo
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200D and 200E. Balance of payments adjustment mechanisms; foreign exchange markets' theories of balance of payments policy and international monetary mechanisms.

260C. International Economics (4) III. Woo (Chairperson in charge)
Seminar—4 hours. Prerequisite: courses 260A and 260B. Survey of current literature in international trade theory.

280. Orientation to Economic Research (2) II. Mayer.
Seminar—2 hours. Course tries to bridge the gap between students' classwork and their subsequent research. It deals with topics such as the origination of a research project, some mechanics of empirical research and hints on the submission of research papers. (S/U grading only.)

290. Topics in Economics (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: consent of instructor. Selected topics in economic analysis and public policy, focusing on current research. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-5 hours. Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor and graduate standing. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

397. Teaching of Economics (2) I. Walton
Lecture-discussion—2 hours. Prerequisite: graduate standing in economics. Teaching of economics: methods of instruction, organization of courses, examination and evaluation procedures. (S/U grading only.)

Economy, Justice, and Society

John E. Roemer, Ph.D., Program Director and Professor of Economics (916-752-3226)

Graduate Study. Beginning in the academic year 1992-93, the Program on Economy, Justice, and Society will offer a designated emphasis in Economy, Justice, and Society. This new emphasis will be open to students pursuing a doctoral degree in philosophy, political science, or economics. The designated emphasis will provide interdisciplinary training in related aspects of economic theory, political theory, and political philosophy. Students choosing the emphasis will take one or two core courses offered by the program, a designated field in their home department, a choice of three designated courses in the other two departments, and will attend an advanced workshop/seminar run by the program. For students choosing the emphasis, these requirements will be in lieu of some requirements for the Ph.D. in the participating departments. Upon graduation, students will receive a Ph.D. in their major with a designated emphasis in Economy, Justice, and Society.

Graduate Adviser. Consult the office of the Program on Economy, Justice, and Society (752-8048).

Education

(Intercollege Division)

Henry T. Trueba, Ph.D., Director of the Division and Associate Dean of the College of Letters and Science (168 Kerr Hall)

G. Phillip Cartwright, Ph.D., Associate Director of the Division

Barbara G. Goldman, Ph.D., Special Assistant to the Director and Assistant Head of Teacher Education

Jon Wagner, Ph.D., Head of Teacher Education and

Director of the CRESS Center
Division Office, 180 Kerr Hall (916-752-8258; FAX: 916-752-5411)
Student Advising, 174 Kerr Hall (916-752-0757)
CRESS Center Office, 202 Wellman (916-752-0281; FAX: 916-752-6135)

Faculty

Donald G. Arnstine, Ph.D., Professor
Hugh C. Black, Ph.D., Professor Emeritus
G. Phillip Cartwright, Ph.D., Professor
Vincent A. Crockenberg, Ph.D., Senior Lecturer
Concha Deigado-Galtan, Ph.D., Associate Professor
Sharon S. Dugdale, Ph.D., Associate Professor
Linnea C. Ehrl, Ph.D., Professor
Richard A. Figueroa, Ph.D., Professor
Patricia C. Gandara, Ph.D., Assistant Professor
Barbara G. Goldman, Ph.D., Lecturer in and Supervisor of Teacher Education (*Education, Applied Behavioral Sciences*)
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
Sandra M. Murphy, Ph.D., Associate Professor
Susan A. Ostergard, Ed.D., Lecturer in and Supervisor of Teacher Education
Jonathan H. Sandoval, Ph.D., Professor
Julius M. Sassenrath, Ph.D., Professor Emeritus
Carlton J. Spring, Jr., Ph.D., Professor
Leroy F. Troutner, Ph.D., Professor Emeritus
Henry T. Trueba, Ph.D., Professor
Jon C. Wagner, Ph.D., Associate Professor
David R. Wampler, Ph.D., Lecturer in and Supervisor of Teacher Education
Karen A. Watson-Gegeo, Ph.D., Professor
George D. Yonge, Ph.D., Professor

Cooperative Research and Extension Services for Schools (CRESS) Staff

Pam Castori, M.A., Education Extension Specialist for Science
Marcia Renee Goodman, Ph.D., Coordinator of Publications, Acting Assistant Director
Jim Hahn, M.A.T., Coordinator for Teacher Research, and Education Extension Specialist for Language Arts
Judith Kysh, M.A., Director, Northern California Mathematics Project
Keith R. Prior, B.A., Director, Northern California Curriculum Consultant Project
Paul Moreau, M.S., Coordinator, Northern California Science Project
Laura Stokes, M.A., Director, Area 3 Writing Project
Jon Wagner, Ph.D., Director

Program of Study

The Division of Education does not offer an undergraduate major program. However, it does offer a minor.

Minor Program Requirements:

Educational theory is considered to be the foundation or basic area for undergraduates to elect as a minor if they wish to (1) major in an allied program, (2) obtain a master's degree in education or allied field, (3) obtain a Ph.D. degree in education, (4) enter a profession that focuses on work with people, (5) seek employment in governmental or industrial training programs, or (6) obtain a better understanding of the issues and concerns of public and private education.

	UNITS
Education (minimum units)	20-23
Education 110 or 111	4
One course from Education 120 or 123	4
Depth courses	12-15
At least 12-15 units from Education not used above: 100, 110, 111, 115, 117, 118, 120, 122, 123, 130, 132, 142, 145, 151, 152, 153, 163, or 175, chosen in consultation with an Education adviser.	
Minor Advisers. All faculty members who teach undergraduate courses.	

*Course not offered this academic year.

Teacher Education Curricula

For a statement of complete requirements and appointments with credential advisers, contact the divisional 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. S.A. Ostergard, D.R. Wampler.

Bilingual Emphasis. B.J. Merino.

Credential Counselors: Single Subject. J.E. Lowry.

Graduate Adviser. J. Wagner (Credential Program).

Graduate Study. The Division 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, Division of Education.

Graduate Adviser. G.D. Yonge (M.A. degree).

Courses in Education**Lower Division Course**

98. Directed Group Study (1-5) I, II, III. The Staff Director in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

100. Introduction to Schools (4) I, II, III. Lowry, Minnis, 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. Ehrl and staff

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 preparation: 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. Cartwright, Figueroa, Spring

Lecture—2 hours. Prerequisite: upper division standing. Educational issues and processes involved in teaching handicapped children.

***117. Psychology of Reading (4) I.** Ehrl

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, Delgado-Gaitan,

Trueba, Watson-Gegeo, Wagner
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 preparation: 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 preparation: Political Science 1.

123. John Dewey and the Foundations of Education (4) I. Arnstine

Lecture/discussion—4 hours. Prerequisite: upper division standing. The philosophical and social foundations of education as interpreted by Dewey. While focusing on his critique of American education and his systematic proposals for reform, attention will also be given to criticisms of Dewey.

***130. Issues in Higher Education (4) III.** 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 preparation: Political Science 1.

***142. School Desegregation and the Civil Rights Movement (4) I.** Crockenberg

Discussion—4 hours. Prerequisite: upper division standing; course 122 or an equivalent course emphasizing legal analysis. The law of school desegregation and its development in the context of the broader movement for civil rights led by Martin Luther King, Jr., with particular attention to the history of school desegregation in California.

145. Aesthetics in Education (4) II. Arnstine

Lecture/discussion—4 hours. Prerequisite: upper division standing. Considers the role of the arts in education. Examines various conceptions of the nature of art and aesthetic experience, and relates this to instructional procedures.

151. Language Development in the Chicano Child (3) I. Merino

Lecture—3 hours. Prerequisite: some knowledge of Spanish and linguistics recommended. Bilingualism, first and second language acquisition, bilingual education, language assessment, Chicano Spanish, and the role of dialect varieties in the classroom.

152. Communication Skills for Bilingual Teachers (3) III. The Staff (Merino in charge)

Lecture/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.

153. Cultural Diversity and Education (2) III. Merino, Minnis, and staff

Lecture/discussion—2 hours. Prerequisite: upper

division standing. Analysis of research on learning styles among culturally-diverse students with review and evaluation of responsive curricula and classroom teaching techniques. The ethnographic interview as a research tool.

160. Peer Counseling (2) I, II. The Staff

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) III.** Figueroa, Sandoval, and staff

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 (Philosophy)

Lecture—2.5 hours; discussion—1.5 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.

Cartwright, Dugdale, Murphy
Lecture—1 hour; seminar—1 hour; laboratory—3 hours. Prerequisite: upper division standing. Applications of computers in education as instructional, intellectual, and communication tools.

192. Internship (1-5) I, II, III. The Staff (Director in charge)

Discussion—1 hour; field work—2 to 15 hours; term paper. Prerequisite: upper division standing; consent of instructor. Internship in schools under supervision of a faculty member. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)

Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Courses

200. Educational Research (3) II. Spring, Ehrl

Lecture—1.5 hours; discussion—1.5 hours. Prerequisite: introductory statistics and graduate standing in education or consent of instructor. Defining educational research questions, reviewing relevant literature, developing research designs, developing research instruments, selecting appropriate data analysis procedures, and writing research projects. A case problem will provide practice in designing and reporting research.

201A. Ethnographic Research in Schools I: Current Theory and Practice (4) II. Delgado-Gaitan, Trueba

Lecture—4 hours. Prerequisite: graduate standing. Review of current literature from anthropology and society related to schools, with emphasis on the organizational structure of institutions, and the analysis of face-to-face interaction. Will explore the relationship between field-based research and theory development on the acquisition of knowledge in specific social and cultural contexts.

201B. Ethnographic Research in Schools II: Field-Based Research Projects (4) III. Trueba, Watson-Gegeo

Discussion—4 hours. Prerequisite: graduate standing and course 201A. Student research projects in specific schools with cooperative critical analysis of the design, data collection, and inferring by researchers. Students will continue to meet with instructor as a group throughout the quarter to discuss specific projects.

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 (4) I. Arnstine, Crockenberg

Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Development of the skills of philosophical analysis and argument for the establishment of a point of view, in the consideration of curriculum theory and practice. Classical and contemporary approaches to subject matter and activity emphases, hidden curriculum, and moral education.

***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 alternate years.

215. Motivation and Behavior Modification (4) III.

Spring

Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Factors related to influencing behavior in educational settings, including analyses of intrinsic and extrinsic motivation, psychological reactance, locus of control, achievement attribution, and behavior modification.

218. Testing Minority Children (4) I. Figueroa

Lecture—3 hours; field work—3 hours. Prerequisite: admission to school psychology program or to M.A. bilingual education program or consent of instructor. Emphasizing tests and techniques that are appropriate for use with Hispanic students. The use of multicultural pluralistic assessment. Review studies and guidelines on use of tests with minority children.

219. Educational Testing and Evaluation (3) III.

The Staff

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) III. Merino

Seminar—3 hours. Prerequisite: course 151; knowledge of a foreign language. Discussion and analysis of recent research in bilingual and second language education. Topics include: language acquisition in second language learners and bilinguals, second language teaching methods, language-use models in bilingual education, interaction analysis in bilingual/cross-cultural classroom, use of the vernacular in classroom.

***252. Multicultural Teaching and Curriculum (3) III.**

Merino

Seminar—2 hours; field work—3 hours. Prerequisite: graduate standing or consent of instructor. Cross-cultural research on socialization, motivation, language acquisition and cognition and its application to effective classroom strategies and curriculum development for minority students. Students will develop and implement multicultural curriculum as well as use ethnographic research techniques in an educational setting.

253. Language and Literacy in Linguistic Minorities (3) II. Merino, Watson-Gegeo

Seminar—2 hours; fieldwork—3 hours. Prerequisite: familiarity with another language and culture; graduate standing. Analysis and application of research on oral language development and literacy in language minority students, through the development, implementation, and evaluation of research-based language arts curriculum.

***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.

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. Staff Development and Supervision of Teachers (4) III.** Minnis

Seminar—4 hours. Prerequisite: graduate standing, course 110, 120. Use of research and legislative guidelines to design staff development for school personnel. Emphasis on school change resulting from staff development programs and the supervision techniques. Supervision as a diagnostic skill and means of teaching teachers skills. Offered in alternate years.

290C. Research Conference in Education (1) I, II, III. The Staff (Director in charge)

Discussion—1 hour. Prerequisite: graduate standing. Presentations and critical discussions of research in education by graduate students with their major professor. May be repeated twice for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Director in charge) (S/U grading only.)**299. Individual Study (1-6) I, II, III.** The Staff (Director in charge)

Independent study—3-18 hours. Individual study under the direction of a faculty member. (S/U grading only.)

299D. Research (1-6) I, II, III. The Staff (Director in charge)

Independent study—3-18 hours. Research for individual graduate students. (S/U grading only.)

Professional Courses**300. Reading in the Elementary School (4) III.** The Staff (Wagner in charge)

Lecture—3 hours; field work—3 hours. Prerequisite: graduate standing. Principles, procedures, and curriculum materials for teaching of reading. Includes decoding skills with a special emphasis on phonics, comprehension skills, study skills, and reading in the content areas.

301. Reading in the Secondary School (4) I, II.

Murphy

Discussion—4 hours. Prerequisite: must be teaching or student teaching. Principles, procedures, and materials to help secondary school teachers improve the reading competence of their students. The teaching of phonics, structural analysis, and alternative methods of coping with the problem reader in the classroom.

302. Language Arts in the Elementary School (2)

I. The Staff (Wagner in charge)

Lecture—2 hours. Prerequisite: graduate standing. Principles, procedures, and materials for the teaching of oral and written expression, listening skills, drama, and children's literature in elementary schools.

303. Art Education (3) III. The Staff (Director 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 (Wagner 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 (Wagner 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 (Wagner 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 (Wagner in charge)

Lecture—2 hours; seminar—2 hours; student teach-

ing—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 (Wagner 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 (Wagner 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 (Wagner 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) III.

Wampler

Lecture/discussion—2 hours. Prerequisite: acceptance into a teacher education program. Principles, procedures, and materials for teaching history and the social sciences in elementary schools.

***309. Early Childhood and Kindergarten Education (3) III.** The Staff (Wagner in charge)

Lecture—3 hours. Prerequisite: upper division or professional standing. Methods, materials, and history of educational programs for the preschool through primary grades. Development of curriculum methods and materials which stress integration of appropriate subject areas with emotional, social, creative, physical, and cognitive development.

322. Methods in Secondary Social Studies (4) I.

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.

323A. Physical Science in the Secondary School (3) I. The Staff (Wagner in charge)

Laboratory/discussion—2 hours; discussion/laboratory—1 hour. Prerequisite: acceptance into a teacher education program. Activity-based overview of concepts and processes in secondary school physical sciences. Emphasis upon philosophy, appropriate teaching methods, materials, assessment and evaluation of learning.

323B. Life Sciences in the Secondary School (3) II. The Staff (Wagner in charge)

Laboratory/discussion—2 hours; discussion/laboratory—1 hour. Prerequisite: acceptance into a teacher education program. Activity-based overview of concepts and processes in secondary school biology and life sciences. Emphasis on philosophy, appropriate teaching methods, materials, assessment and evaluation of learning, and issues.

324. Teaching Methods in Mathematics (3) II. Dugdale

Lecture—3 hours. Prerequisite: acceptance into a teacher education program; student teaching (concurrently); a mathematics background or consent of instructor. Methods and curriculum for teaching mathematics at the secondary level (grades 9-12). Review of innovative mathematics programs in the State.

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 program. Provides opportunity to acquire evaluation and supervisory skills in the field under the supervision of University staff and an experienced program evaluator/supervisor in bilingual/cross-cultural education.

361A-361B-361C. School Psychology: Introduction (3-3-3) I-II-III. Sandoval and staff

Seminar—2 hours; fieldwork—3 hours (minimum). Prerequisite: admission to school psychology credential program. History and theory of school psychology. Application of psychological theory to educational problems. Reading and mathematics curriculum for school psychologists. Crisis intervention and counseling in the schools. Fieldwork in schools and other institutions serving children. (S/U grading only.)

362A-362B-362C. School Psychology: Advanced (3-3-3) I-II-III. Sandoval, Figueroa, Gandara

Seminar—2 hours; field work—4 hours. Prerequisite: courses 361A-361B-361C, 213, 218, 219. Theory and techniques of school-based mental health 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 (8-12) I, II, III. Sandoval, Figueroa, and staff

Seminar—2 hours; Internship—18-32 hours. Prerequisite: admission to school psychology credential program; courses 361A-361B-361C, 362A-362B-362C, 213, 218, 219. Individual assessment and program evaluation, mental health consultation, intervention strategies to promote the school learning and adjustment of children. Selected topics in school psychology. (S/U grading only.)

398. Group Study (1-5) I, II, III. The Staff (Director in charge)

(S/U grading only.)

399. Individual Study (1-5) I, II, III. The Staff (Director in charge)

(S/U grading only.)

Education Abroad Program

Carolyn F. Wall, Ph.D., Campus Coordinator

Program Office, 323 South Hall (916-752-3014)

Programs of Study

The Education Abroad Program (EAP) of the University of California offers students who meet the minimal admission requirements the opportunity to experience a different culture while making progress toward degree objectives. Students interested in the language, literature, art, culture, history, or governmental or social institutions of the countries or areas where study centers are located will gain substantially from first-hand academic and practical experience. The same is true for students of foreign affairs. All 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.

Estimated all-inclusive minimum costs for the nine- to twelve-month program range from \$7,000 to \$16,000 (varies depending upon the country).

Application

Normally, students participate in the program during their junior year, but a limited number of students may be selected for participation as seniors. A few programs are open to sophomores and to graduate students as well. Students considering study abroad with the EAP should contact the EAP Office early in the fall quarter concerning application and filing deadlines. This is important, as deadlines for some centers, including the United Kingdom and Ireland, are in early November.

Eligibility requirements include:

- At least three regular session quarters completed in residence at UC by the time of participation
- At least 84 quarter units completed by the time of participation, except for specific short-term programs
- At least a 3.0 grade-point average for course work completed at UC at the time of application and departure; except for Mexico SFE and Togo SFE programs where the minimum GPA requirement is 2.0
- 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

Application forms are available from the EAP Office. A provisional academic planning form, prepared in consultation with the EAP Adviser and the major adviser, must be submitted along with the completed application to the EAP Office prior to the appropriate deadline. Applications received after the official deadline cannot be considered.

For study abroad during the 1992-93 academic year, the application deadlines are as follows: mid-October for spring semester programs in China and the USSR, and the Japan Global Security Studies spring quarter program; mid-November for the United Kingdom and Ireland, Japan, and the spring quarter programs in Mexico and Costa Rica; mid-May for Australia, New Zealand, and the year program in Costa Rica; and mid-to-late January for all other study centers. If you intend to participate in a study program during your senior year, careful advance planning is necessary to make sure that all degree requirements

will be met. Consult with your major adviser, the Dean's Office of your college, and the campus EAP coordinator. For information on EAP centers and study programs, refer to EAP in the Programs and Courses section of this catalog.

Students who do not meet the minimal requirements for acceptance (see under Education Abroad in the Introduction section) must consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the beginning of their planned year of study abroad must receive permission from the Campus Coordinator before submitting an application; the probability of such students being accepted is low.

Selection

The Academic Senate Committee on the Education Abroad Program is intimately involved in the selection of EAP participants on the Davis campus. This committee strongly recommends that prospective participants take appropriate courses dealing with the country of their interest in preparation for the year abroad. Applicants who are taking or have completed such courses at the time of the campus selection process tend to have an increased probability of receiving the endorsement of the Committee, other factors being equal. Lists of suggested courses and reading materials are available in the EAP Office.

Once the completed application materials have been filed, an applicant will be interviewed by a selection committee consisting of faculty and EAP returnees. Among other things, academic goals, knowledge of the host country and the United States and proficiency in the language of the host country, when applicable, will receive considerable attention during the interviews.

Files of applicants receiving the endorsement of the Senate Committee on EAP are forwarded to the Systemwide Office of the EAP on the Santa Barbara campus, where further selection decisions will be made.

Academic Program

In most cases, students from the University of California live as the students of the host country do and attend the same courses, taught by faculty of the host country in their own language. Thus, language skills are very important. To aid adjustment of UC students to different, often unfamiliar educational practices, tutorials are a part of the academic program of most centers. Tutorials also assist in overcoming language problems and provide cultural background information presupposed in the courses. Tutorials are taught by graduate students or junior staff of the host university and are offered in association with courses in which a sufficient number of UC students have enrolled.

To assist in the adjustment and the academic work of the students, faculty members of the University of California serve as Directors and/or Associate Directors at most of the study centers abroad.

The academic program of each student includes: (1) an intensive preparatory course in the language of the host country (except for the programs in the United Kingdom, Ireland, Canada, Australia, Egypt, Ghana, Hungary, 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 accept-

ed in satisfaction of major requirements. Several major programs have identified key upper division courses which must be completed in residence at Davis. Major advisers should be consulted early so that the pre-departure program at Davis will be planned appropriately.

All degree candidates must meet the University residence requirement. Students planning to graduate immediately upon completion of participation in the EAP may satisfy residence requirements within the final 45 units preceding entrance into the EAP. Otherwise, subject to prior approval of the major department or program concerned, the requirement may be satisfied as follows: Within the final 90 units earned toward the degree, 35 units must be completed in residence in the student's College or School, 12 units of which must be completed after returning from EAP participation. With this option, no more than 55 units taken abroad may be applied toward the unit requirement for graduation. The applicant's College or School Dean is the source for information on the University residence requirement and additional residence requirements that may be imposed.

Participants who satisfy all degree requirements while abroad and expect to graduate upon completion of the year abroad should file for candidacy to receive the degree in September. Unfortunately, transcripts from abroad take a long time to get to the home campus and are not received in time for EAP returnees to be included on the June degree list. Such returning students may participate in the June commencement ceremony, however.

Study Centers

At any one center, the courses and fields of study open to UC students may be limited. Moreover, each of the host institutions has special areas of excellence and strength. The listing of centers below incorporates selected information concerning these points. More detailed information is available in the flyers describing each of the centers and from the EAP adviser in South Hall.

In addition to the programs listed below, Davis students have access to a variety of study and work abroad opportunities. Information can be obtained at the EAP Office in South Hall.

Europe

Austria. The program is small and is designed to offer an opportunity to pursue a specialized interest to a limited number of highly qualified students. A compulsory intensive language course in Strolb and Vienna 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. Students may also apply to the Summer Intensive Language Program only as a short-term program option.

University of Copenhagen. Broad availability of humanities and social sciences. Programs in communications, economics and international politics, history, linguistics, and medieval studies are of particular interest.

France. A compulsory intensive language course precedes the beginning of the academic year. All courses in the universities are taught in French. UC faculty directors are in residence at Bordeaux, Lyon and Paris.

University of Bordeaux. Broad areas of the humanities and social sciences. The Institute of Political Science and the Institute of Prehistory (Anthropology) are well known.

University of Grenoble. Mainly in the social sciences through the Université des Sciences Sociales

(Grenoble II); some humanities. Offerings in anthropology and psychology are limited. Not suitable for physical or life sciences.

University of Lyon. Social sciences, art history; modern languages and linguistics; Arabic studies.

Paris Center for Critical Studies. Film theory, literary criticism, philosophy, theater (literature, criticism, and history), historiography, and limited art history.

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 Bearnais 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. Budapest University of Economics, 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 Bologna. Humanities, social sciences, economics, history.

University of Padua. History of art (including archaeology), Italian literature (including linguistics), and political science (which includes history, social sciences, geography, and demography, as well as political science in the American sense). Sciences are not available for UC students.

University of Venice. Economics, history; history of art.

Conservatorio di Musica G.B. Martini, Bologna. Individual instruction in music performance; composition; music history. An audition is required for admission.

Accademia delle Belle Arti di Venezia, Venice. Art studio and some art history. Colored slides of portfolio of artistic work and successful completion of entrance examination required for admission.

Il Bisonte International School of Graphic Arts. Etching and lithography for advanced undergraduates. Colored slides of portfolio of etchings must be submitted for admission.

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 Alcalá de Henares. Spanish language and literature, history and economics.

University of Barcelona. Humanities (with emphasis on Spanish art, history, literature, linguistics) and some social sciences. Courses developed for the Center and taught by the University of Barcelona form the core of the program. EAP students are required to take at least two regular year-long courses in the University of Barcelona. (This is a cooperative program with the University of Illinois.)

University of Madrid. Humanities and some social sciences. The core program, developed for the UC Study Center and other American programs, concentrates on Spanish studies in the broadest sense. Core and Study Center courses are taught by Spanish faculty. EAP students are required to take two regular year-long courses in the University of Madrid.

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 15 institutions, is administered by a director and associate director located in London. Following selection for participation by the EAP administration, a student must still be accepted by a specific department in one of the host institutions. In many host institutions, the student can pursue studies in that department only. Participating institutions are England: *University of Birmingham, University of East Anglia, University of Exeter, University of Hull, University of Kent at Canterbury, University of Lancaster, University of Leeds, University of Sheffield, University of Sussex, University of York*. Occasionally, students may be placed on an *ad hoc* basis at other institutions.

Ireland: *University College, Cork, University College, Galway*.

Scotland: *University College, Glasgow, 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-long programs are available, depending on language preparation. Students with two or two and one half years of university-level Russian participate in an intermediate-level program developed for UC. Those with three or more years of university-level Russian may apply for the advanced-level program. Both programs are primarily intended for language majors, but are open to students of literature, history, area studies, etc.

Herzen State Pedagogical Institute, Leningrad. 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 intensive language course in Haifa precedes the beginning of the academic year.

Hebrew University, Jerusalem. Broad curriculum; emphasis on Israel and Middle Eastern studies. UC students enroll in a special program for foreign students, taught in English. The program offers courses in Judaic, Israeli, Middle Eastern studies, and a few courses in the general social sciences and humanities, science and business. Students with command of Hebrew have access to a broad curriculum throughout the Hebrew University.

Asia

Hong Kong. A limited selection of courses is offered in English. Knowledge of Chinese is not required for acceptance; however, all students are required to complete at least two courses in Chinese culture, history, or language prior to departure. A compulsory intensive Cantonese program precedes the beginning of the academic year. All students are required to include 18 units of Mandarin or Cantonese in their annual program.

Chinese University of Hong Kong. Humanities and social sciences, with emphasis on Chinese studies. Art studio and music performance courses are available. (Information about courses to be offered in English is announced only one week before instruction begins.)

India. Instruction is in English. A compulsory intensive language program in conversational Hindi precedes the academic year. Students will take a year-long core program focusing on development in modern India and Indian culture and tradition, as well as continue their study of Hindi. During the second and third quarters, students will also take regular course work at the University of Delhi.

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. A variety of study opportunities are available to UC students. Language requirements vary depending upon the host institution and the academic focus of the program. A summer intensive language course prepares students for year-long programs. The programs are administered by a director located in Tokyo.

Doshisha University, Kyoto. Humanities and social sciences; emphasis on Japanese language and culture. This center serves students having more advanced study of Japanese; at least two, preferably three, years of UC Japanese language study.

Global Security Studies Program, Meiji Gakuin University, Yokohama. This spring quarter program provides students the opportunity to study world peace

and security issues. Previous Japanese language study is preferred, but not required.

Inter-University Center for Japanese Language Studies (IUC), Yokohama. This program offers an intensive program of training for graduate students in Japanese language. The prerequisite is two years of university-level Japanese.

International Christian University, Mitaka (Tokyo). Humanities and social sciences; emphasis on Japanese language and intercultural communication. A limited number of courses taught in English are available. At least one year of university-level Japanese language study is required.

Kyushu Institute of Technology, Kitakyushu. This program, which specializes in Civil, Mechanical, and Electrical Engineering, is primarily for undergraduate students. While pursuing a research project, students will engage in language courses and a seminar on Japanese-American comparative engineering methods. One year of university-level Japanese required prior to departure.

Kyushu University, Fukuoka. This program is for graduate-level economics students. The academic program consists of Japanese language courses and a research project to be completed under the guidance of a Japanese professor. Prior Japanese language study is not required.

Nagoya University, Nagoya. This program is for graduate level economics students. The academic program includes intensive Japanese language study and research conducted under the supervision of a Japanese professor. The prerequisite is two years of university-level Japanese.

Osaka University, Osaka. Undergraduate students study Japanese language and a set program of economics courses. Instruction is in English during the fall semester and in Japanese during the spring. A minimum of two years of university-level Japanese is required.

Sophia University, Tokyo. Comparative culture studies, Japanese language and literature, history, political science, economics and business are available. Many are taught in English. The prerequisite is one year of university-level Japanese.

Tohoku University, Sendai. This program is primarily for graduate students in most fields with well-developed research projects. Participants will study Japanese language, in addition to working on their research projects under the guidance of a Japanese professor. Graduate study in Engineering may also be available. Undergraduates at the advanced level in Japanese may be able to participate in a language and culture program. The prerequisite is two to three years of university-level Japanese.

Tokyo Institute of Technology. Graduate students proficient in Japanese may do research and take courses in science and engineering.

People's Republic of China. EAP offers a full-year program in Beijing and a fall semester program in Tianjin. Intensive language study in Chinese is the primary emphasis of all programs.

Beijing University of Science and Technology. Students receive a half-year of academic credit and financial support for studying standard Chinese and teaching English to Chinese students. The prerequisite is two years of Chinese language and one course in teaching English as a foreign language.

Nankai University, Tianjin. This fall semester program includes Chinese language study and courses taught in English on Chinese culture and civilization. The prerequisite is one year of college-level Chinese. Students must take an intensive language program in July and August prior to the start of the semester.

Peking University. A year-long program focused on advanced-level instruction in Chinese language and literature. Courses are conducted by the Chinese Language Teaching to Foreigners Division of Peking University. The prerequisite for the program is two years of college-level Chinese.

Taiwan, Republic of China. Students participating in the Chinese Language and Culture Studies program in Taipei receive instruction in the Chinese lan-

guage and enroll in lecture courses (taught in English) on Chinese culture and society arranged by CSU International Programs. Courses in art history, literature, economics, history and political science are available. Prior course work in Chinese culture, history and language are recommended.

(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.

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 course work 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 administered by the Council on International Educational Exchange (CIEE).)

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.

Ecuador. (This is a temporary option through the 1991-92 academic year, with the possibility of becoming a permanent program.) As all instruction is in Spanish, students must have completed at least two years of university-level Spanish prior to departure.

Pontificia Universidad Católica del Ecuador, Quito. During the fall semester students take Spanish language courses and study the history, politics, and culture of Ecuador and Latin America. In the spring, students can study in a variety of fields, including languages and literature, archaeology, biology, economics, anthropology, and sociology.

Mexico. *Universidad Nacional Autónoma de México (UNAM), Mexico City.* A compulsory intensive language program precedes the beginning of the school year, augmented by courses in contemporary Mexico (history, art, literature, etc.). Students have the option of spending one semester (two UC quarters) at UNAM, or a full year. All instruction is in Spanish.

Study and Field Experience (SFE) in Mexico. Available for either Fall 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 course work. Students must have completed a minimum of one year of university-level Spanish, or the equivalent, by departure.

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 Católica, 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 Indiana University and a number of California universities.)

Canada

Students may enroll for a full year. Studies on the major or a closely allied field is expected.

University of British Columbia (UBC), Vancouver. Most academic disciplines are available. Areas of special interest include Pacific Rim and Canadian Studies.

Australia and New Zealand

As is appropriate in the Southern Hemisphere, the academic year extends from the beginning of instruction in 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 Uni-

versity of Sydney, and the *University of New South Wales* in Sydney; *University of Adelaide* and *Flinders University* in South Australia; and the *University of Wollongong* in Wollongong. A full range of academic programs is available. The Study Center accommodates a limited number of students. A UC faculty member in Melbourne directs all programs.

The New Zealand program includes the *University of Auckland, Lincoln College* in Christchurch, the *University of Otago* in Dunedin, *Massey University* in Palmerston North, and *Victoria University* in Wellington. All academic disciplines are available; programs in textiles and a variety of agricultural sciences are of special interest.

Endocrinology (A Graduate Group)

Judith Turgeon, Ph.D., Chairperson of the Group
Group Office, 4136 Medical Sciences-1A (Human Physiology, 752-3230)

Faculty. The Group includes faculty from the Schools of Medicine, Veterinary Medicine, the California Primate Research Center, and the College of Agricultural and Environmental Sciences.

Graduate Study. The interdepartmental Graduate Group in Endocrinology offers programs of study leading to the M.S. and Ph.D. degrees. Research and instruction are offered in topics ranging from endocrinological processes at the cellular and molecular levels to integrative systemic endocrinology. Graduate students receive a strong background in required basic cellular, biochemical and integrative endocrinology and related course work, plus have the opportunity to select specific fields of emphases such as molecular mechanisms of hormone action, signal transduction, metabolism regulation, growth factors, neuroendocrinology, and reproduction.

Graduate Advisers. Contact the Program Office.

Courses in Endocrinology

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.)

235. Personal Computing in the Life Sciences (3) , II, Matthews

Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Current and near-future uses of "state-of-the-art" personal computers and local area networks. Applications in the Life Sciences. Running programs on Macintosh IIX and 80386-based PC-compatible computers and on 3-Com local area network in Endocrinology Graduate Group Computer Laboratory.

240. Biochemical Endocrinology (3) III, Adams

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Examination of recent advances in biochemical endocrinology and molecular and cell biology of endocrine systems with emphasis on processes of hormone and receptor

synthesis, second messenger phenomena, and hormonal control of gene expression.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and current trends in research in endocrinology. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(SU grading only.)

Endocrinology and Metabolism

See Internal Medicine in Medicine, School of

Engineering

(College of Engineering)

M. S. Ghausi, Ph.D., Dean

Benjamin J. McCoy, Ph.D., Associate Dean—Research

Zuhair A. Munir, Ph.D., Associate Dean—Graduate Studies

James F. Shackelford, Ph.D., Associate Dean—Undergraduate Study

Billy Sanders, Ph.D., Assistant Dean

College Office, 2132 Bainer Hall (916-752-0553)

Undergraduate Study

Fifteen 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, Mechanical Engineering, Aeronautical Science and Engineering, and Computer Science and Engineering curricula are seven programs which have been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), the nationally recognized accrediting body for engineering curricula.

The four-year undergraduate program is divided into two parts: the **Lower Division Program** and the **Upper Division Program**.

Graduate Study

See the Graduate Division section of this catalog. For additional information refer to the *College of Engineering Bulletin*, obtainable from the Dean's Office, or phone the Graduate Study Office (916-752-0592).

Lower Division Programs

If you enter the College of Engineering with fewer than 84 quarter units of credit, follow one of the four Lower Division Programs shown below. The first program (I) is common to majors in Aeronautical Science and Engineering, Civil Engineering, Materials Science and Engineering, Mechanical Engineering, and combinations of these majors; (II) is for those majoring in Agricultural Engineering and the three Agricultural Engineering options: Aquacultural 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 those 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 Bachelor's Requirements section, under "College of Engineering, Unit Requirements."

Lower Division Program I

Requirements for Aeronautical Science and Engineering, Civil Engineering, Civil Engineering/Materials Science and Engineering, Mechanical Engineering, and Mechanical Engineering/Materials Science majors 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 9A-9B-9C-9D*.....	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—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	6
Humanities-Social Sciences electives and /or General Education electives*.....	9	
Unrestricted electives*.....	7	
(*Students majoring in Civil Engineering or Civil Engineering/Materials Science and Engineering are required to complete 12 units of physics including Physics 9A, 9B and 9C. In addition, either Physics 9D, Chemistry 1C, Biological Science 1A 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. Civil Engineering majors take Civil Engineering 10 in place of 3 units of unrestricted electives.)		
Total Lower Division Units.....	90	

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus, Mathematics 21A-21B-21C.....	12	1-2-3
Linear algebra, Mathematics 22A.....	3	6
Differential equations,		

Total Lower Division Units.....90

Lower Division Program II

Requirements for major in Agricultural Engineering, and the three Agricultural Engineering options (Aquacultural 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
General physics, Physics 9A-9B-9C-9D.....	16	3-4-5-6
General chemistry, Chemistry 1A-1B.....	10	2-3
Organic chemistry, Chemistry 8A.....	3	6
Biological Sciences 1A, 1B, 1C.....	15	4-5-6
Engineering graphics in design, Engineering 4.....	3	1
Applications of computers, Engineering 5.....	3	2
Surveying, Civil Engineering 10 (Required for Forest Engineering option only).....	3	3
Circuits, Engineering 17.....	3	5
Statics, Engineering 35.....	3	5
Properties of materials, Engineering 45.....	4	4
Expository writing, English 1.....	4	1
Introduction to public speaking or group communication, Rhetoric and Communication 1 or 3.....	4	2
Humanities-Social Sciences electives and General Education electives.....	8	1-3
Total Lower Division Units.....	97-100	

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 9A-9B-9C.....	12	3-4-5
Physics 9D 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—English 1 or 3, or 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 and /or General Education electives.....	16	
Total Lower Division Units.....	97	

Lower Division Program IV

Requirements for majors in Electrical Engineering, Electrical Engineering/Materials Science and Engineering, and Computer Science and Engineering only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus, Mathematics 21A-21B-21C.....	12	1-2-3
Linear algebra,		

*Course not offered this academic year.

Mathematics 22A.....3	6
Differential equations, Mathematics 22B.....3	5
Vector analysis, Mathematics 22C.....3	4
General Physics, Physics 9A-9B-9C-9D.....16	3-4-5-6
General Chemistry, Chemistry 1A-1B or 4A-4B10	1-2 or 2-3
Introduction to engineering systems, Engineering 3.....3	1 or 2
(Engineering 3 is designed for fresh- man students. More advanced stu- dents may petition to substitute 3 units of technical electives for Engi- neering 3)	
Engineering Computer Science 30 or 354-8	1 or 2
(Majors in Computer Science and Engi- neering are required to take Engi- neering Computer Science 40 (4 units) in addition to course 30.	
Computer structure and assembly language, Engineering Electrical and Computer Science 704	3 or 4
Circuits, Engineering 173	6
Statics, Engineering 353	4 or 5
Properties of materials, Engineering 454	4 or 5
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 and/or General Education electives.....12	
Total Lower Division Units88-92	

Upper Division Programs

If you have completed the requirements for the lower division program or have entered the College of Engineering with *more than 84* quarter units of credit, you should follow the upper division requirements for the major you have selected from the programs that follow.

Aeronautical Science and Engineering

Aeronautical Science and Engineering is the branch of engineering that applies scientific knowledge to the design, manufacture and operation of aircraft. 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 employment in government or industry, while simultaneously establishing an excellent foundation for graduate studies.

The fundamental disciplines of this branch of engineering apply to all bodies and vehicles whose applied loads are influenced by aerodynamic forces. Within this context, aeronautical engineers are involved with automobiles, trains, ships and submarines, aircraft, rockets and missiles, sports equipment, and a variety of energy systems.

The fundamental engineering disciplines are supplemented with courses in aircraft propulsion, aerodynamics, aircraft performance, stability and control, aircraft preliminary design, aeronautical structures, and aeroelasticity.

A broad range of technical elective courses is available. Some students choose their 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, aeroelasticity,

flight testing, or component and mechanism design. While students should consult with their adviser before selecting technical electives, there are a number of electives which could be recommended to all aeronautical science and engineering students regardless of their chosen area of specialization. These include

- Engineering 102L, 105L, 106, 122, 190
- Aeronautical Science and Engineering 131, 135, 137, 139
- Materials Science and Engineering 140, 142
- Mechanical Engineering 150A, 150B, 150L, 162, 172, 184A, 184B, 186, 187
- Electrical and Computer Science Engineering 150
- Applied Science Engineering 115
- Civil Engineering 131A

Suggested advisers: J.W. Baughn, J.J. Chattot, M.M. Hafez, R.A. Hess, L.W. Rehfield, N. Sarigul-Klijn, J.L. Steger, C.P. van Dam, B.R. White.

Aeronautical Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 192.

UNITS

- Subject Areas and Courses**
- Electronic circuits—Engineering 1004
- 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—Aero-
nautical Science and Engineering 1253
- Aerodynamics—Aeronautical Science and Engi-
neering 126, 1278
- Aircraft propulsion, performance, stability and
control—Aeronautical Science and Engi-
neering 128, 129, 138A12
- Aircraft preliminary design—Aeronautical Science
and Engineering 130.....4
- Aeronautical structures—Civil Engineering 131B,
Aeronautical Science and Engineering
1356
- Measurement systems—Mechanical Engineering
176.....3
- Controls and system analysis—Mechanical Engi-
neering 1714
- Applied mathematics—Engineering 1803
- Technical electives10

Students are urged to consider choos-
ing from Engineering 102L, 105L, 106,
118, 122, 190, Aeronautical Science
and Engineering 131, 137, Materials
Science and Engineering 140, 142,
Mechanical Engineering 150A, 150B,
150L, 162, 172, 184A-184B, 186, 187,
Electrical and Computer Science Engi-
neering 150, Applied Science Engi-
neering 115, Civil Engineering 131A.

Humanities-Social Sciences electives and /or
General Education electives15

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 challenging and socially useful career.

Agricultural engineers create systems, equipment, and processes for the production and utilization of biological materials. They integrate a cross section of engineering disciplines, with special attention to the interface between physical systems and biological products. Agriculture (including nursery and greenhouse enterprises), food processing and manufacturing, timber production and forest management, and aquaculture are among the many areas in which agricultural engineers are prepared to serve.

Each area is involved with producing, handling, packaging, storing and transporting biological materials. The practice of agricultural engineering requires an understanding of the unique properties of these materials and the knowledge to control their environment, thereby creating optimal conditions for biological activity.

Agricultural engineers often work in interdisciplinary teams with biological scientists and other engineering specialists. The growth of biotechnology, environmental issues, and concern for the interface of human beings with engineering systems have created new and exciting opportunities. Agricultural engineers are needed to provide engineering solutions for taking the advances in the biological sciences out of the laboratory and into the real world.

The program allows students to select one of four curricula, depending on their specific interests, while it retains the versatility to adapt to careers in several areas. All curricula share a common lower division program and a common core of courses in the upper division. The first upper division curriculum (1) provides a general program in Agricultural Engineering, with the opportunity to focus on a particular area of interest. The remaining curricula provide options for (2) Aquacultural Engineering, (3) Food Engineering, and (4) Forest Engineering.

Agricultural Engineering

Curriculum 1

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Agricultural Engineers are concerned with the production, processing, packaging, and use of biological materials. This program requires the integration of engineering with a spectrum of biological disciplines and creates the opportunity for many areas of specialization, depending on student interest.

For example, irrigation and drainage specialists apply engineering principles in the design and operation of water systems for biological production. Structures and environment specialists design structures to provide optimum environments for plant production in greenhouses, product storage and conditioning, and animal production. Power and machinery specialists design, develop, and apply machinery and energy systems for crop production and processing. Electronics and electrical systems specialists develop sensors, instrumentation, and control systems for monitoring and controlling production environments and post-harvest processes.

The senior year design project provides students with an opportunity to focus on an area of special interest. Additional courses in this area can be selected with the help of an adviser.

Minimum units required for major: 196.

UNITS

- Subject Areas and Courses**
- Electronic circuits and microcomputers—
Engineering 100 and Agricultural Engineering
165.....8
- Applied mechanics and thermodynamics—Engi-
neering 102A, 102B, 103A, 104A, 104B, and
105A18
- Engineering economics—Engineering 1063
- Mathematics—Applied Science Engineering
115 or Engineering 1803
- Statistics—Civil Engineering 1143
- Agricultural engineering—Agricultural Engineering
114, 125, 132 and 14514
- Engineering design11
- (a) Agricultural Engineering 170A,
170B, and 170C.
- (b) Select one course from Civil Engi-
neering 132A, 145, Mechanical Engi-
neering 150A.
- Professional responsibilities—Engineering
190.....3
- Humanities-Social Sciences electives and/or Gen-
eral Education electives16
- Biological and agricultural sciences9
- Select from Agronomy 100, Animal Sci-

*Course not offered this academic year.

ence 2, Biochemistry and Biophysics 101A, Botany 111, 112, Chemistry 8B, 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 courses11
Agricultural Engineering 112, Civil Engineering 141, 141L, Engineering 111.

Total Units for Upper Division Program99

Aquacultural Engineering

Curriculum 2

Aquacultural 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 in controlled aquaculture operations is a primary consideration.

Minimum units required for major: 202.

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 or Engineering 180.....3

Statistics—Civil Engineering 1143

Agricultural Engineering10

Select three courses from Agricultural Engineering 114, 125, 132, and 145.

Engineering design11

(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 and/or General Education electives16

Biological and agricultural sciences15

Select from Animal Science 118, Environmental Studies 150A, 151, Wildlife and Fisheries Biology 102, 120, 121, and 122.

Technical electives15

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 Program105

Food Engineering

Curriculum 3

Food engineering is the application of engineering principles and concepts to the 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 of food storage, refrigeration, drying, freezing, and food manufacturing are studied. Summer internships in the California food industry are usually available and students are encouraged to make use of these opportunities.

Minimum units required for major: 201.

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 105A18

Engineering economics—Engineering 1063

Mathematics—Applied Science Engineering 115 or Engineering 1803

Statistics—Civil Engineering 1143

Agricultural Engineering10

Agricultural Engineering 132, plus two courses from Agricultural Engineering 114, 125, and 145.

Engineering Design11

(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 and/or General Education electives16

Biological and agricultural sciences16

Biochemistry and Biophysics 101A, Chemistry 8B, Food Science and Technology 104, 111, 150 or 151.

Required technical courses13

Engineering 103B, 105B, 111, Mechanical Engineering 165.

Total Units for Upper Division Program104

Forest Engineering

Curriculum 4

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. Fall quarter of the junior year is spent on the Berkeley campus, following an eight-week summer field course sequence at the UC Forestry Camp near Quincy.

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

Minimum units required for major: 212.5.

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 105A18

Engineering economics—Engineering 106.....3

Mathematics—Applied Science Engineering 115 or Engineering 1803

Statistics—Civil Engineering 1143

Agricultural Engineering10

Select three courses from Agricultural Engineering 114, 125, 132, and 145.

Engineering design11

(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 and/or General Education electives16

Summer camp15

Forestry 100A, 100B, 100C, 100D, 100E†

Biological and agricultural sciences9

Forestry 125.† Select three units from:

Forestry 101, 110, 113, 120 (or Soil Science 100), Forest Products 132.†

Required technical courses13.5

Agricultural Engineering 115, 116, Forestry 102, (or Geography 106), 103†

Total Units for Upper Division Program112.5

†Forestry and forest products courses offered only by Berkeley campus.

Chemical Engineering

Chemical Engineering is concerned with the application of the principles of chemistry and engineering to the creation 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 12 units of technical electives and 6 units of advanced chemistry 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. Please talk to the instructors of the courses listed about possible prerequisites before enrolling.

The *premedical* and *prebiomedical engineering* areas of specialization have been specifically designed to prepare the student for graduate work in biomedical engineering or to meet the undergraduate requirements for entrance into medical school. Because of the emphasis on the natural sciences and the application of fluid mechanics, mass transport, heat transfer, thermodynamics, reaction kinetics, and process dynamics to problems in natural science, students are well prepared to understand problems in living systems. Many biological phenomena, such as blood flow, solute transport, and energy exchange, can be dealt with using the theoretical tools 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, 128C, 129B, 129C,
130, 131, 150

Textiles and Clothing 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, 118C, 119, 121A, 121B,
128A, 128B, 128C, 131, 132A, 132B, 185A,
185B

Biochemical Engineering. This area of specialization prepares students to do graduate work in biochemical engineering and for employment in the biotechnology, pharmaceutical, and food industries.

Suggested technical electives:

Strongly recommended

Microbiology 102 (Instead of Physics 9D), 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
Plant Science 140

Viticulture and Enology 186

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 studies is the use of computers. Development of expert systems for detecting process failures, using computer-aided design (CAD) packages to optimize product yields, solving large numbers of equations on supercomputers to assess transient behavior of processes, and implementation of plantwide control systems are all examples of chemical engineering endeavors based on 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 170, 175

Numerical Analysis and Optimization:

Applied Science Engineering 115, 116

Mathematics 128B-C, 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 chemical 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 the layout and fabrication of such devices.

Suggested technical electives:

Computer Science Engineering 140

Chemical Engineering 163

Electrical and Computer Science Engineering 145A,
145B, 145C

Physics 140A, 140B

Energy Engineering. This area of specialization is designed to introduce the student to the various

energy sources and energy conversion methods.

Suggested technical electives:

Agricultural Engineering 112

Engineering 111, 162

Environmental Studies 167, 169

Mechanical Engineering 161, 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: chemical reaction processes coupled with fluid mechanics, heat transfer, and mass transfer. Such a foundation in basic chemical engineering science, plus the usual chemical engineering analysis and design courses and courses on environmental topics, prepares 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

Recommended

Atmospheric Science 121A, 121B, 158

Civil Engineering 242A, 242B, 242BL,
244

Environmental Studies 110

Environmental Toxicology 101, 112A,
112B, 131

Water Environment

Strongly recommended

Chemical Engineering 161

Civil Engineering 140, 140L, 148A,

148B

Microbiology 102 (Instead of Physics
9D)

Recommended

Biochemistry and Biophysics 101A,
101B

Civil Engineering 147, 240, 243A, 243B,
244, 245, 246, 248A

Environmental Studies 110, 150A, 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 102 (Instead of Physics 9D)

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, psychology, and statistics in market planning and forecasting and in strategically developing and promoting new products.

Suggested technical electives:

Management 250, 251

Agricultural Economics 113, 130, 136

Psychology 183

Statistics 103

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 courses.

Suggested technical electives:

Four to six courses from

Anatomy 100, Biochemistry and Biophysics
101A, 101B, Biological Sciences 1A, 1B, 1C,

10, Physiological Sciences 101A, 101B, Physiology 110, 111A, 111B, 112, 113, 114, Zoology 121, 130.

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 pre-veterinary) 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 Biochemistry and Biophysics 101A, 101B, Biological Sciences 1A, 1B, 1C, Genetics 100, Microbiology 102, Physiology 110, 112, 113, 114, Zoology 100, 121.

Chemical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 193.

UNITS

Subject Areas and Courses

Engineering—Engineering 100, 1067

Chemical engineering—Chemical Engineering
150A, 150B, 151, 152A, 152B, 153, 154A,
154B, 155A, 155B, 156A, 156B, 157, 157L,
158, 159, 160.....58

Chemistry—Chemistry 110A, 110B, 110C.....9

Advanced chemistry electives6

To be selected from upper division courses in Chemistry, 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 electives12

Humanities-Social Sciences/General Education
electives8

Total Units for Upper Division Program100

Chemical Engineering/Materials Science and Engineering

Minimum units required for major: 200.

UNITS

Subject Areas and Courses

Engineering—Engineering 100, 1067

Chemical engineering—Chemical Engineering
150A, 150B, 151, 152A, 152B, 153, 154A,
154B, 155A, 155B, 156A, 156B, 157, 157L,
158, 159, 160.....58

Chemistry—Chemistry 110A, 110B, 110C.....9

Materials science—Materials Science Engineering
130, 132, 134, 138, and two courses chosen
from Materials Science Engineering 140, 142,
144, 147, and three laboratory courses
chosen from Materials Science and Engineer-
ing 132L, 134L, 138L, 140L, 142L, and
144L.....21

Humanities-Social Sciences electives and/or General
Education electives8

Total Units for Upper Division Program103

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 to 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; however, 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 125 and 125B, Environmental Studies 160 and 166, Political Science 108, 109, 186, and Sociology 143A. 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, 146, 152, 153, 160, 161, 162
Economics 125, 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, J.R. Lund, P. Mokhtarian, D. Sperling.

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:

Atmospheric Science 120, 121A, 121B, 158
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 154A, 154B, 156A, 156B
Chemistry 107A, 107B, 110A, 128A, 128B
Civil Engineering 140, 140L, 142L, 145, 146, 147, 148B, 149, 152
Engineering 180
Environmental Studies 150A, 150B, 150C, 151, 166
Mathematics 128A, 128B, 128C
Microbiology 102, 105, 130A
Statistics 130A, 130B

Suggested advisers: D.P.Y. Chang, J. Darby, O.G. Raabe, E.D. Schroeder, G. Tchobanoglous.

Structural Engineering, Structural Mechanics, and Geotechnical Engineering. This area is concerned with 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 of structures—such as mathematical analysis and characterization of material properties.

Suggested technical electives:

Aeronautical Science and Engineering 135, 137
Art 121A
Civil Engineering 131B, 132A, 132C, 133, 134, 137, 138, 139, 173, 174, 176
Engineering 122, 138, 180
Mathematics 128A, 128B, 128C

Suggested advisers: K. Arulananadan, Y.F. Dafalias, L.R. Herrmann, J.R. Hutchinson, I.M. Idriss, B. Kutter, K.D. Mish, M.R. Ramey, K.M. Romstad, 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. Students should acquire an awareness of the social sciences and environmental sciences through courses in these areas.

Suggested technical electives:

Civil Engineering 137, 149, 152, 153, 160, 161, 162, 163
Engineering 160
Environmental Studies 167, 168A, 168B, 171, 173, 178, 179

Suggested advisers: P. Jovanis, R. Kitamura, P. Mokhtarian, D. Sperling.

Water Resources Engineering. This area includes hydrology, hydraulics, and water resources systems planning and design. Hydraulics is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures. Water resources system planning and design is concerned with the comprehensive development of water resources for multiple use. Emphasis is placed on principles of planning, analysis, and engineering design and operation as related to the water needs of industry, agriculture, recreation, and other activities.

Suggested technical electives:

Agricultural Economics 148, 176
Atmospheric Science 120, 121A, 121B
Civil Engineering 142L, 144, 145, 146, 148B, 152, 153
Electrical and Computer Science Engineering 112, 151
Environmental Studies 128, 150A, 151
Geography 162
Water Science 103, 110, 150, 160

Suggested advisers: M.L. Kavvas, J. King, B.E. Larock, J.R. Lund, M.A. Marifo.

Civil Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 100 or 1113-4†
Applied mechanics—Engineering 102A, 103A, 104A, 104L10
Applied thermodynamics—Engineering 105A or Chemistry 110A3
Structures—Engineering 104B; Civil Engineering 131A6
Soil mechanics—Civil Engineering 171, 171L‡5

†One unit of Engineering 100 applies toward the Technical electives requirement.

‡Civil Engineering 10 is a required prerequisite to Civil Engineering 171. The extent of further specialization is chosen by the student with the help of departmental advisers.

Hydraulics and water resources—Civil Engineering 141, 141L, 1427
Environmental—Civil Engineering 148A3
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 1063
Engineering mathematical analysis—Applied Science Engineering 115; Civil Engineering 114, and either Applied Science Engineering 116, Civil Engineering 131B or 1539
Transportation electives—select from Civil Engineering 160, 161, or 1633
Technical electives9†
Six of these units must be selected from engineering courses.

Humanities-Social Sciences electives and/or General Education electives11

Total Units for Upper Division Program.....90-91

Civil Engineering/Materials Science and Engineering

Minimum units required for major: 184.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 1004
Applied mechanics—Engineering 102A, 103A, 104A, 104L10
Applied thermodynamics—Engineering 105A or Chemistry 110A; Materials Science Engineering 1306
Structures—Engineering 104B; Civil Engineering 131A6
Soil mechanics—Civil Engineering 171, 171L‡5
Hydraulics and water resources—Civil Engineering 141, 141L, 1427
Environmental—Civil Engineering 148A3
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 1063
Engineering mathematical analysis—Applied Science Engineering 115; Civil Engineering 114, and either Applied Science Engineering 116 or Civil Engineering 131B or 1539
Materials science—Materials Science Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Materials Science Engineering 140, 142, 144, 147 or Civil Engineering 13318
Humanities-Social Sciences electives and/or General Education electives11
(Civil Engineering 137 recommended.)

Total Units for Upper Division Program.....94

Electrical Engineering and Computer Science (See also Computer Science)

The Department of Electrical Engineering and Computer Science administers three undergraduate curricula: Electrical Engineering, Computer Science and Engineering, and Electrical Engineering/Materials Science and Engineering. The Department, through the Division of Computer Science, also administers a Computer Science curriculum in the College of Letters and Science which is described in detail under the listing "Computer Science" in this catalog.

The upper division requirements for the degrees in Electrical Engineering, Computer Science and Engineering, and Electrical Engineering/Materials Science and Engineering are described below. Lower division requirements are listed under Lower Division Curricula at the beginning of the Engineering section. Please note that the lower division requirements for these majors are found in "Lower Division Program IV."

Electrical Engineering

Electrical Engineering involves the design, analysis, and effective use of electrical systems. Electrical systems play central roles in nearly all aspects of modern life, including home entertainment, space exploration, medicine, communications, transportation, energy, industrial automation, defense, commerce, and education.

The Electrical Engineering curriculum combines a strong background in the scientific and theoretical aspects of electrical engineering with a practical knowledge of the design of electrical systems to prepare students both for careers in industry and graduate study.

The Electrical Engineering curriculum is designed to provide you with a solid background in mathematics and physical science preparatory to a study of fundamental electrical engineering principles, including electromagnetics, physical electronics, and electronic circuits. Through the choice of upper division technical electives, you are then able to concentrate your studies in one of the many specialized fields of electrical engineering. Examples of some of the possible fields of specialization are circuits and electronics, signal processing, computer engineering, controls, automation, solid-state electronics, communication, microwaves, and electro-optics. You should select the elective courses leading to a specialty in consultation with a faculty adviser.

Electrical Engineering/Materials Science and Engineering

In addition to the general Electrical Engineering curriculum, the Department of Electrical Engineering and Computer Science offers a double major in Electrical Engineering/Materials Science and Engineering. In the past decade, the fields of solid-state electronics, opto-electronics, magnetics, and superconductors have developed to the point that demands for new materials now pace progress in these fields. Materials scientists with an electronics background are key to continued progress in these areas. The Electrical Engineering/Materials Science and Engineering curriculum is designed to provide such a background.

Computer Science and Engineering

Computer Science and Engineering encompasses the organization, design, development, analysis, theory, programming, and application of digital computers. It spans the hardware-software spectrum and, thus, combines many aspects of computer science and computer engineering.

The Computer Science and Engineering curriculum has been designed to meet the demand for graduates knowledgeable in all major aspects of digital computers. As a consequence, it is broader than either computer engineering or computer science. Compared with computer engineering (i.e., the Electrical Engineering degree with a specialization in computer design), it is distinguished by the additional study of software systems and computational theory. Compared with computer science, it is distinguished by the inclusion of many engineering and design-oriented courses.

Through the selection of upper division technical electives, students are able to emphasize either hardware or software design within the Computer Science and Engineering curriculum.

Electrical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

UNITS

Subject Areas and Courses

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, 140A9
 Electrical Engineering breadth requirements —

select nine units from Electrical and Computer Science Engineering 131A, 140B, 151, 157A, 160, 1719
 Professional responsibilities—Engineering 1903
 Engineering science—Engineering 102A, 105A6
 Probability Theory—Statistics 120, 131A or Mathematics 1314
 Design electives—select six courses (at least two courses with a laboratory) from Electrical and Computer Science Engineering 114, 118, 132A, 132B, 146A, 146B, 150, 152, 157B, 161, 172, 175, 176, 177, 182A, 182B, Computer Science Engineering 110, 140, 142, 150, 160, 165, 168, 175 (may include approved 192 or 199 course)18
 Additional technical electives15
 Humanities-Social Sciences electives and/or General Education electives12
Total Units for Upper Division Program92

Computer Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 186.

UNITS

Subject Areas and Courses

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, 140A7
 Engineering science—Engineering 102A, 105A6
 Discrete structures and probability—Computer Science Engineering 100, plus one course from Statistics 120, 131A, or Mathematics 1317
 Computer hardware —Electrical and Computer Science Engineering 171, 1788
 Computer science theory—Computer Science Engineering 110, plus Computer Science Engineering 120 or 1227
 Those planning to take Computer Science Engineering 142 as an elective should elect Computer Science Engineering 120
 Computer software—Computer Science Engineering 140, 160, plus Computer Science Engineering 150 or Electrical and Computer Science Engineering 182A (Students planning to take Electrical and Computer Science Engineering 182B as an elective should elect Electrical and Computer Science Engineering 182A)12
 Computer electives9
 Hardware emphasis—select courses from Electrical and Computer Science Engineering 114, 118, 151, 172, 175, 177
 Software emphasis—select courses from Computer Science Engineering 120, 122, 142, 152, 165, 168, 170, 172, 175, Electrical and Computer Science Engineering 182B
 (May include up to 3 units of approved Electrical and Computer Science Engineering or Computer Science Engineering 199.)
 Technical electives10
 Humanities-Social Sciences electives and/or General Education electives12
Total Units for Upper Division Program94

Electrical Engineering/Materials Science and Engineering

Minimum units required for major: 186.

UNITS

Subject Areas and Courses

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, 140A, 140B12
 Design Electives—select two courses from the following list: Electrical and Computer Science Engineering 114, 118, 132A, 132B, 146B, 175, 176, 177, 182A, 182B6
 Materials science—Materials Science Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Materials Science Engineering 140, 142, 144, 14718
 Thermodynamics—Materials Science Engineering 130, Engineering 105A6
 Engineering science—Engineering 102A, 104A6
 Advanced Science—Geology 117A, 117B, or Physics 104A, 104B, or Physics 121, 122A, or Chemistry 110A, 110C6
 Laboratory courses—Materials Science Engineering 149, Electrical and Computer Science Engineering 148A6
 Probability Theory—Statistics 120, 131A or Mathematics 1314
 Technical Electives6
 Humanities-Social Sciences electives and/or General Education electives12
Total Units for Upper Division Program98

Materials Science and Engineering

Materials Science and Engineering is directed towards an understanding of the structure, properties, and behavior of materials. Society demands new and improved materials with capabilities far superior to common metals, alloys, and ceramics. New materials are needed for high-speed transportation systems, surgical and dental implants, new generations of power plants, and solid-state electronic devices in computer and communication technology.

Both the development of new materials and the understanding of present-day materials demand a thorough knowledge of basic engineering and scientific principles including crystal structure, elastic and plastic behavior, thermodynamics, phase equilibria and reaction rates, and physical and chemical behavior of engineering materials.

The services of materials engineers are required in many different engineering operations; they study subjects ranging from fracture behavior in automobiles to fatigue behavior in aircraft frames, from corrosion behavior in petro-chemical refineries to radiation-induced damage in nuclear power plants, and from fabrication of steel to design of semiconductors. Materials engineers are also increasingly involved in developing the new materials needed to attain higher efficiencies in existing and proposed energy conversion schemes, and will play a central role in the development of new technologies based on composites and high temperature superconductivity.

The curriculum is based on a common core of courses basic to engineering. These courses, taken during your first two years, provide a strong foundation in fundamental engineering concepts. In your third year, you will take a set of "fundamentals" courses (Materials Science Engineering 130, 132, 134, 138). With this background, you are then ready for the "applications" courses (Materials Science Engineering 140, 142, 144, 147, 149) which are recommended for the fourth year.

Twelve technical elective units may be selected to complete the undergraduate Materials Science and Engineering program. By selecting the appropriate technical electives and Humanities and Social Science/General Education electives, you may orient the program to suit your interests and career objectives. These objectives may 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 in Materials Science and Engineering.

The following technical elective courses and the suggested areas of specialization are guidelines to assist you and your adviser in the preparation of study lists.

Suggested technical electives:

Aerospace Structures:

Aeronautical Science and Engineering 130, 135, 137, 139
Civil Engineering 131B

Automatic Control and Systems Analysis:

Mechanical Engineering 171, 172, 185, 187, 188
Electrical and Computer Science Engineering 150, 157A, 157B

Biomedical Engineering:

Chemistry 107A, 107B
Biological Sciences 1A, 1B
Physiology 111A, 111B, 112, 113
Physical Education 101, 102

Chemical Corrosion:

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

Computers:

Applied Science Engineering 115
Computer Science Engineering 110, 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 140A, 140B, 145A, 145B, 146A, 146B, 148
Physics 121, 140A, 140B

Environmental Engineering:

Engineering 160
Atmospheric Science 120
Biochemistry and Biophysics 101A, 101B
Water Science 41
Chemistry 8A, 8B
Civil Engineering 149

Heat Transfer:

Engineering 105B
Mechanical Engineering 165
Chemical Engineering 150A, 153

Materials Design and Processing:

Aeronautical Science and Engineering 137
Engineering 104B, 106
Materials Science and Engineering 146, 148
Mechanical Engineering 150A, 150B, 150L, 151, 152, 185
Civil Engineering 139

Physics of Solids:

Physics 115A, 115B, 140A, 140B
Electrical and Computer Science Engineering 145A, 145B, 145C, 148

Suggested advisers: J.C. Gibeling, J.R. Groza, D.G. Howitt, A.K. Mukherjee, Z.A. Munir, J. F. Shackelford.

Materials Science and Engineering

Minimum units required for major: 184.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 1004
Applied mechanics—Engineering 102A, 103A, 104A9
Applied thermodynamics—Engineering 105A, 1306
Engineering design elective—select from Aeronautical Science and Engineering 137, Civil Engineering 132A, 132B, 133, Mechanical Engineering 150A, 150B, 150L6
Materials in design—Materials Science Engineering 140, 1496

Measurements and laboratory—Materials Science Engineering 132L, 134L, 138L, 140L, 142L, 144L; Mechanical Engineering 1769
Materials science—Materials Science Engineering 132, 134, 138, 142, 144, 14718
Applied mathematics—Engineering 1803
Basic science—Chemistry 110A and 110C or Physics 140A-140B6
Technical electives (Engineering 104B recommended)12
Humanities-Social Sciences electives and/or General Education electives15
Total Units for Upper Division Program94

Mechanical Engineering

The mechanical engineer uses basic science in the design and manufacture of complex engineering systems requiring the application of physical and mechanical principles 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. Your 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 either prepare for graduate study in Mechanical Engineering or obtain a broad background for entering engineering practice at the bachelor's level.

You are encouraged to select elective courses from among the areas of specialization listed below.

AREAS OF SPECIALIZATION:

Creative Design. The creation and improvement of products, processes, or systems that are mechanical in nature are the primary activities of a professional mechanical engineer. The solutions to such major social problems as environmental pollution, lack of mass transportation, and shortages of raw materials will depend heavily on the engineer's ability to create new types of machinery and mechanical systems.

The engineer-designer must have a solid and relatively broad background in the basic physical and engineering sciences and have the ability to solve a variety of problems. In addition to having technical competence, the designer must be able to consider the socioeconomic consequences of 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, 122, 160
Materials Science Engineering 140, 142
Mechanical Engineering 134, 150B, 150L, 151, 152, 161, 162, 172, 184A, 184B, 185, 187, 188

Suggested advisers: F.O. Eke, A.A. Frank, J.M. Henderson, M.L. Hull, B. Ravani, S. Velinsky, K. Yamazaki.

Energy Systems. This area is specifically designed for those who would like to work in the fields of power generation, propulsion for transportation, and energy conversion. In these fields, the increased efficiency of systems and the impact of potential environmental pollution are assuming more importance in the design stage.

The program of study is based on the fundamentals of fluid mechanics, thermodynamics, and heat transfer. These fundamentals are applied to combustion engines, gas turbines, heat exchangers, nuclear reactors, fusion powerplants, solar energy systems, and others.

Suggested technical electives:

Engineering 160
Mechanical Engineering 162, 186

Suggested advisers: J.W. Baughn, H. Brandt, H.A. Dwyer, M.A. Hoffman, I. Kennedy, W. Kolmann, A.A. McKillop.

Systems Dynamics and Control. Engineers are increasingly concerned with the performance of integrated dynamics systems in which it is not possible to optimize component parts without considering the overall system.

Systems Dynamics and Control 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 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, 184A, 184B, 187
Engineering 122

Suggested advisers: J.W. Brewer, F.O. Eke, A.A. Frank, R.A. Hess, M. Hubbard, D.C. Karnopp, D.L. Margolis.

Transportation Systems. An important aspect of Mechanical Engineering is the planning, design, and operation of transportation systems. As society recognizes the increasing importance of optimizing transportation systems to minimize environmental degradation and energy expenditure, engineers will need to consider major innovations in the way people and goods are moved. Such innovations will require competence in vehicle dynamics, propulsion, and control, and an understanding of the problems caused by present-day modes of transportation.

Suggested technical electives:

Aeronautical Science and Engineering 127, 128, 129
Civil Engineering 131A, 149A, 160
Engineering 122, 160
Mechanical Engineering 134, 152, 162, 172, 184A, 184B, 187

Suggested advisers: A.A. Frank, M. Hubbard, D.C. Karnopp, D.L. Margolis.

Mechanical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Minimum units required for major: 186.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 1004
Applied mechanics—Engineering 102A, 102B, 104A, 104B12
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 16510
Fluid mechanics—Engineering 103A, 103B6
Mechanical engineering design—Mechanical Engineering 150A, 150B, 150L, or 172, and one course from 184A-184B, 185, 186, 187, 18813
Controls and systems analysis—Mechanical Engineering 1714

Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176.....	6
Professional responsibilities—Engineering 190.....	3
Applied mathematics—Engineering 180.....	3
Technical electives.....	20
Select 12 of the 20 units from upper division Engineering or Mechanical Engineering courses. In order to satisfy design requirements, select three courses (of the 12 units) from the following: Engineering 122, Materials Science Engineering 140, Aeronautical Science and Engineering 129, 130, Mechanical Engineering 150B, 172, 184A-184B, 185, 186, 187, 188 (Select the remaining courses from courses not used for design requirements above), 134, 151, 152, 162.	
Humanities-Social Sciences electives and/or General Education electives.....	15
Total Units for Upper Division Program.....	96

Mechanical Engineering/Materials Science and Engineering

Minimum units required for major: 192.

UNITS

Subject Areas and Courses

Electronic circuits—Engineering 100.....	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B.....	12
Applied thermodynamics—Engineering 105A, 105B; Materials Science Engineering 130; Mechanical Engineering 185.....	13
Fluid mechanics—Engineering 103A, 103B.....	6
Mechanical engineering design—Mechanical Engineering 150A, 150B, 150L, or 172, and one course from 184A-184B, 185, 186, 187, 188.....	13
Controls and systems analysis—Mechanical Engineering 171.....	4
Materials science—Materials Science Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Materials Science 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.....	5
In order to satisfy design requirements, select two courses from Aeronautical Science and Engineering 129, 130, Materials Science Engineering 140, 149, Mechanical Engineering 150B, 172, 184A-184B, 185, 186, 187, 188 (these courses may not be used for design units above), 134, 151, 152, 162.	
Humanities-Social Sciences electives and/or General Education electives.....	15
Total Units for Upper Division Program.....	102

Courses in Engineering

Lower Division Courses

- 3. Introduction to Engineering Systems (3) I, II.**
The Staff (Chairperson 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.**
Yamazaki
Lecture—2 hours; laboratory—3 hours. Principles of descriptive geometry and of mechanical and free-hand drawing; their application in the representation, visualization, and solution of engineering problems.

Computer-aided graphics. Introduction to engineering design. (CAN Engr 2)

5. Applications of Computers (3) I, II, III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A. Digital computation and computer programming in FORTRAN. Algorithms and their description. Basic programming; debugging of programs; approximate computing-accuracy and significance; solving simple numerical and non-numerical problems. (CAN CSci 4)

11A-11B. Issues in Engineering (1-1) II, III. Shackelford
Lecture—1 hour; discussion—1 hour. Prerequisite: participation in the Minority Engineering Program (MEP) or consent of instructor. Designed to broaden students' understanding of the engineering profession: its methods, principles, design, and development process; career opportunities; and professional resources.

17. Circuits (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 9C. Basic electric circuit analysis techniques, including electrical quantities and elements, resistive circuits, transient and steady-state responses of RLC circuits, sinusoidal excitation and phasors, and complex frequency and network functions. (CAN Engr 6)

20. The Technological World (3) II. The Staff
Lecture—3 hours. Prerequisite: high school algebra. The nature of technology; computers and automation; energy systems; engineering design, analysis, and problem solving; metric system; patents and creativity. Technology and social change; technology assessment and technological choices. Intended primarily for students who are not engineering or science majors. Engineering or physical science students may receive only 2 units of credit. General Education credit: Nature and Environment/Introductory.

35. Statics (3) I, II, III. The Staff (Shen in charge)
Lecture—3 hours. Prerequisite: Mathematics 22C (may be taken concurrently); Physics 9A. Force systems and equilibrium conditions with emphasis on engineering problems. (CAN Engr 8)

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. (CAN Engr 4)

Upper Division Courses

100. Electronic Circuits and Systems (4) I, II, III.
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
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C. Kinematics and kinetics of particles, of systems of particles, and of rigid bodies applied to engineering problems.

102B. Dynamics (3) II, III. The Staff
Lecture—3 hours. Prerequisite: course 102A; open to College of Engineering students only. Topics in three-dimensional rigid-body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) II, III. The Staff
Lecture—1 hour; laboratory—1 hour. Prerequisite: course 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
Lecture—3 hours. Prerequisite: course 102A (may be taken concurrently). Fluid properties; fluid statics; continuity and linear momentum equations for control volumes; flow of incompressible fluids in pipes; dimensional analysis.

103B. Elementary Fluid Mechanics (3) II, III. The Staff

Lecture—3 hours. Prerequisite: course 103A; open to College of Engineering students only. 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—1 1/2 hours. (alternate weeks with course 105L). Prerequisite: course 103B (may be taken concurrently). Basic principles and devices which are common in fluid mechanics are illustrated with a series of experimental demonstrations. Experiments are concerned with flow, pressure and viscosity measurement. (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; open to College of Engineering students only. Fundamental concepts of thermodynamics: heat energy and work, properties of pure substances, First Law and Second Law for closed and open systems, reversibility, entropy, thermodynamic temperature scales; power cycles: Carnot, Rankine, Brayton; and applications of thermodynamics to engineering systems.

105B. Thermodynamics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 105A; open to College of Engineering students only. Irreversibility and availability, thermodynamic relations, gas and vapor mixtures, and chemical reactions.

105L. Thermodynamics Laboratory (1) II, III. Baughn
Lecture—1 hour, discussion—1 hour, and laboratory—1 1/2 hours (alternate weeks with course 103L). Prerequisite: course 105B (may be taken concurrently). Demonstrations and experiments to illustrate the principles of state, the first and second laws of thermodynamics, and thermodynamic cycles. (P/NP grading only.)

106. Engineering Economics (3) II, III. Hartsough, Slaughter
Lecture—3 hours. Prerequisite: upper division standing in Engineering. The analysis of problems in engineering economy; the selection of alternatives; replacement decisions. Compounding, tax, origins and cost of capital, economic life, and risk and uncertainty are applied to methods of selecting most economic alternatives.

111. Electric Power Equipment (3) I, III. Delwiche, Hartsough
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.

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.

160. Environmental Physics and Society (3) I.

Jungerman, Craig
Lecture—3 hours. Prerequisite: Physics 9D, 5C, or 10 or 1B and Mathematics 16B or the equivalent. Impact of humankind on the environment will be discussed from the point of view of the physical sciences. Calculations based on physical principles will be made, and the resulting policy implications will be considered. (Same course as Physics 160.) General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Physics 10.

162. Advanced Energy Technology (4) I.

Craig
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105A or consent of instructor. Technical overview of energy technologies. Emphasis on semi-quantitative understanding. About 20 percent of course is policy oriented. Designed to mesh with course 160, which is primarily policy. (P/NP grading only.) Offered in alternate 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.

The Staff
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 Courses**254. Manufacturing Engineering (3) II.**

Dorf
Lecture—3 hours. Prerequisite: course 106, Statistics 120, and Electrical and Computer Science Engineering 157A or Mechanical Engineering 172. Manufacturing and process engineering, productivity, planning, production and operations, inventory and facilities, quality, robots and flexible manufacturing systems.

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.)

John M. Krochta, Ph.D., Professor
Coby Lorenzen, Jr., M.S., Professor Emeritus
Miguel A. Mariño, Ph.D., Professor
Kathryn McCarthy, Ph.D., Assistant 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 H. Piedrahita, Ph.D., Assistant Professor
Thomas R. Rumsey, Ph.D., Associate Professor
Verne H. Scott, Ph.D., Professor Emeritus
R. Paul Singh, Ph.D., Professor
David C. Slaughter, Ph.D., Assistant 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.**

Studer
Lecture—1 hour. Introduction to the types of problems addressed by agricultural engineers working with biological systems: agricultural production, forest engineering, aquacultural engineering, food engineering and biological engineering. Opportunities for engineers with interests and backgrounds in biology. (P/NP grading only.)

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.)

92. Internship in Agricultural Engineering (1-5) I, II, III.

The Staff (Studer in charge)
Internship. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work 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. Combustion Engines (4) II.**

Jenkins
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 5 and 105A. Theory of design and operating characteristics of internal and external combustion engines. Thermodynamics of relevant power cycles, performance testing, engine mechanics, fuel metering systems, ignition systems for both spark-ignited and compression-ignited engines. Design for engine applications. Comparison of alternative fuels and engines.

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: Engineering 104A; Forestry and Resource Management 103, 125 (Berkeley campus). Applications of engineering principles to problems in forestry, including those in forest regeneration, harvesting and transportation.

116. Forest Engineering Field Problems (2) I.

Miles
Lecture—1 hour; three weekend field trips to Blodgett Forest. Prerequisite: course 114 or 115. A field study

and critical analysis of operations, techniques, and equipment common in forest management, with particular consideration to measurements, data analysis, safety of operations, and maintenance practices.

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.

145. Irrigation and Drainage Systems (4) II.

Walender, Grismer, Hills
Lecture—4 hours. Prerequisite: Engineering 103A or Water Science 142. Engineering and scientific principles applied to the design of surface, sprinkle and micro irrigation systems and drainage systems within economic and environmental constraints. Interaction between irrigation and drainage will be emphasized. (Same course as Water Science 145.)

165. Digital Instrumentation in Agricultural Engineering (4) I.

Delwiche
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Digital logic concepts and devices; assembly language programming; data acquisition and control.

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.

**Engineering:
Agricultural**

(College of Engineering)

Henry E. Studer, M.S., Chairperson of the Department

Department Office, 2030 Bainer Hall (916-752-0102)

Faculty

Norman B. Akesson, M.S., Professor Emeritus
Robert H. Burgy, M.S., Professor Emeritus
William J. Chancellor, Ph.D., Professor
Pictlaw (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 Emeritus
Mark E. Grismer, Ph.D., Associate Professor
Bruce R. Hartsough, Ph.D., Associate 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

- 192. Internship in Agricultural Engineering (1-5) I, II, III.** The Staff (Studer in charge)
Internship. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work 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 alternate years.
- 220. Pilot Plant Operations in Aquacultural Engineering (3) III.** Piedrahita
Lecture—1 hour; laboratory—6 hours. Prerequisite: Civil Engineering 243A-243B or Agricultural Engineering Technology 161A-161B. Topics in water treatment as they apply to aquaculture operations. Laboratory study of unit operations in aquaculture. Offered in alternate years.
- 235. Advanced Unit Operations in Process and Food Engineering (3) II.** T. Rumsey
Lecture—3 hours. Prerequisite: an upper division course in process or food engineering. Basic procedures applicable to process and food engineering. Heat and mass transfer applications to drying, dehydration and freezing; flow of food and semi-fluid materials; size reduction; respiration of bio-materials.
- 240. Infiltration and Drainage (3) II.** Grismer
Lecture—3 hours. Prerequisite: Soil Science 107; Water Science 140. Aspects of multiphase flow in soils and their application to infiltration and drainage. Gas phase transport and entrapment during infiltration, and transient drainage with nonlinearity, capillarity, and evapotranspiration considered. Offered in alternate years.
- 241. Sprinkle and Trickle Irrigation Systems (3) III.** Hills
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 145. Computerized design of sprinkle and trickle irrigation systems. Consideration of emitter mechanics, distribution functions and water yield functions.
- 242. Hydraulics of Surface Irrigation (3) III.** Wal-lender
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 alternate years.
- *250. Design of Mechanical Systems (2) I.**
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.

- 260. Analog Instrumentation (4) II.** Delwiche
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Instrument characteristics: generalized instrument models, calibration, and frequency response. Signal conditioning: operational amplifier circuits, filtering, and noise. Transducers: motion, force, pressure, flow, temperature, and photoelectric. Offered in alternate years.
- 265. Design and Analysis of Engineering Experiments (4) 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, T. Rumsey
Lecture—3 hours. Prerequisite: Civil Engineering 212A. Mathematical modeling of biological systems: model development; analytical and numerical solutions. Case studies from various specializations within Agricultural Engineering. Offered in alternate years.
- 275. Physical Properties of 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 in (A) Simulation of Food Processing Systems, (B) Thermal Process Design, (C) Mass Transfer in Food and Biological Systems, and (D) Alternate Energy Systems.
- 290. Research Methods in Agricultural Engineering (2) I.** Giles
Lecture—1 hour; discussion-laboratory—1 hour. Prerequisite: graduate student standing or consent of instructor. Planning, execution, and reporting of research projects. Literature review techniques and proposal preparation. Identification of sources for support of research. Oral presentation of research results. Written presentation of research results, manuscript preparation, submission, and review.
- 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.** Singh
Laboratory—3 hours; tutorial—3-9 hours. Prerequisite: graduate standing; consent of instructor. Tutoring and teaching students in undergraduate courses offered in the Department of 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.)

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 (916-752-0360)

Faculty

Berni J. Alder, Ph.D., Professor
Meera M. Blattner, Ph.D., Associate Professor
Stewart D. Bloom, Ph.D., Professor Emeritus
Stewart Cameron, Ph.D., Assistant Professor
Richard Christensen, Ph.D., Professor
Paul P. Craig, Ph.D., Professor
Stephen P. Cramer, Ph.D., Professor
John S. De Groot, Ph.D., Professor
R. Paul Drake, Ph.D., Professor
Roger A. Haas, Ph.D., Professor
William G. Hoover, Ph.D., Professor
David Q. Hwang, Ph.D., Associate Professor
John Killeen, Ph.D., Professor Emeritus
Nelson Max, Ph.D., Professor
William A. Newcomb, Ph.D., Adjunct Professor
Ann Orel, Ph.D., Associate Professor
Richard F. Post, Ph.D., Professor Emeritus
Garry Rodrigue, Ph.D., Professor
Wilson K. Talley, Ph.D., Professor
Edward Teller, Ph.D., University Professor Emeritus
Rao Vernuri, Ph.D., Professor
Frederick Wooten, Ph.D., Professor
Yin Yeh, Ph.D., Professor

Courses in Engineering: Applied Science

Davis

Lower Division Courses

- 98. Directed Group Study (1-5) I, II, III.** The Staff (Wooten in charge)
Prerequisite: consent of instructor 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, III.** De Groot
Lecture—3 hours. Prerequisite: course 115 or consent of instructor. Application of computers to solution of physical problems. Numerical solution of elliptic, parabolic, and hyperbolic partial differential equations; eigenvalue problems, Monte Carlo methods, linear programming.
- 137. Science and Technology of Nuclear Arms Effects and Control (3) I.** Jungerner (Physics), Craig
Lecture—3 hours. Prerequisite: upper division standing; one course from Physics 1B, 5B, 9D, or 10. Scientific and technical aspects of nuclear arms effects and nuclear arms control including the nuclear physics of atomic and hydrogen bombs, blast and radiation effects, radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. (Same course as Physics 137.) General Education credit: Nature and

Environment/Non-Introductory. Recommended GE preparation: Physics 10.

147. Arms Race Technologies and Strategies (3) I. Craig

Lecture—2 hours; discussion—1 hour. Prerequisite: course 137/Physics 137. Technological and strategic issues in the nuclear arms race. Characteristics of nuclear weapons and weapons defense systems; responses and counter-responses. Advantages and disadvantages of alternative realizations of weapons systems.

165A. Quantum Optics I (3) II. Yeh

Lecture—3 hours. Prerequisite: Physics 110A-110B or the equivalent. Quantum nature of light and matter. Statistics of photons in chaotic, coherent and mixed states. Concepts of photon coherence and correlation. Development of a coherent state from a chaotic photon distribution.

165B. Quantum Optics II (3) III. Yeh

Lecture—3 hours. Prerequisite: course 165A or the equivalent. Quantum nature of interaction between light and matter: photoelectric counting statistics. Photon distributions in scattering processes and in nonlinear optical processes.

166A. Quantum Optics Laboratory (1) II. Yeh

Laboratory—3 hours. Prerequisite: course 165A concurrently. 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. DeGroot

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 insta-

stabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

289A-J. Special Topics In Applied Science (1-5) I, II, III. The Staff (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. Introduction 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 are required.

108. 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.

135. Introductory Nuclear Science and Technology (3) I. The Staff

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.

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.

204A. Artificial Intelligence (3) II. Blattner
Lecture—3 hours. Prerequisite: courses 101, 106, 111. Concepts required to understand artificial intelligence. Goal reduction, exploiting constraints, control mechanisms, and storing common sense knowledge are introduced. LISP programming language is used. Offered in alternate years.

204B. Knowledge Representation (3) III. Blattner
Lecture—3 hours. Prerequisite: courses 204A, 211, or 212. Representation of knowledge requires some language or communicative medium to describe knowledge about the world. Course explores expressive adequacy, computational efficiency, non-deductive and non-monotonic reasoning associated with some knowledge representation schemes. Offered in alternate years.

204C. Rule-Based Expert Systems (3) II. The Staff
Lecture—3 hours. Prerequisite: course 204A. Construction of rule-based interpreters. Includes knowledge representation schemes, relational model of data, inferencing strategies, control strategies, and the practical use of rule-based expert systems. Offered in alternate years.

205A. Mathematical Methods (3) I. Newcomb
Lecture—3 hours. Prerequisite: calculus. Complex variables, theory of convergence, evaluation of definite integrals, factorial function (gamma function), asymptotic expansions, fourier analysis.

205B. Mathematical Methods (3) II. Newcomb
Lecture—3 hours. Prerequisite: course 205A. Laplace transforms, Sturm-Liouville Theory, solution of second order linear ODE, approximate solutions of ODE, calculus of variations, characteristics.

205C. Mathematical Methods (3) III. Newcomb
Lecture—3 hours. Prerequisite: course 205B. Spherical harmonics, Bessel functions, conformal mapping, hypergeometric functions, elliptic functions.

206. Programming Languages (3) III. The Staff
Lecture—3 hours; programming project. Prerequisite: course 106 or the equivalent. Examines topics in language design as the contour model and binding times, abstract data types, functional languages, and syntax analysis.

207. Compiler Construction (3) I. The Staff
Lecture—3 hours. Prerequisite: course 206. Syntax-directed translation techniques are used to implement a compiler for a block-structured, high-level programming language. Emphasis given to semantic analysis and code generation.

208A. Operating Systems I (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 108, 203B. Design of an operating system. Emphasis given to mechanisms commonly used to implement systems and the various policy options. Course stresses the Kernel design approach.

208B. Operating Systems II (3) II. The Staff
Lecture—3 hours. Prerequisite: course 208A. Concentration on operating system structure, interprocess communication, and issues of naming, error control, protection, synchronization, abstract object representation and encoding, resource management, and measurement in distributed operating systems. Course integrates design goals, problems, and mechanisms.

***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.

210A. Numerical Methods in Applied Science (3) I. The Staff

Lecture—3 hours. Prerequisite: calculus through differential equations and vector analysis. Numerical techniques used in a wide variety of applications of digital computers to problems in applied science. Emphasis placed on the common mathematical elements of the techniques developed.

210B. Numerical Methods in Applied Science (3) II. The Staff

Lecture—3 hours. Prerequisite: course 210A. Numerical methods applicable to the solution of partial differential equations. Emphasis on finite-difference, finite element, and spectral methods for linear hyperbolic, parabolic, and elliptic systems and nonlinear hyperbolic systems.

210C. Numerical Methods in Applied Science (3) III. The Staff

Lecture—3 hours. Prerequisite: course 210B. Computational methods in various fields including: fluid mechanics, kinetic theory, solid mechanics, quantum mechanics.

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.

213A. Computer Graphics (3) II. Max

Lecture—3 hours. Prerequisite: course 113. Development of algorithms for perspective line drawings of three-dimensional objects, as defined by polygons or bicubic patches.

213B. Computer Graphics (3) III. Max

Lecture—3 hours. Prerequisite: course 213A. Emphasis on algorithms to produce color shaded raster renderings of three-dimensional models.

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 alternate years.

215A. Mathematical Methods in Computer Science (3) II. The Staff

Lecture—3 hours. Prerequisite: course 210A. Mathematical techniques common to advanced computing science and scientific computing. Examination of methods used in statistical analysis and probability theory, with applications to queues and other models.

215B. Mathematical Methods in Computer Science (3) III. The Staff

Lecture—3 hours. Prerequisite: course 215A. Empha-

sis on the mathematical methods utilized in the study of data structures and computer architecture.

216A-G Special Topics in Computer Science (1-5) I, II, III.

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: (A) Architecture; (B) Software Systems; (C) Language Translation; (D) Language Design; (E) Operating Systems; (F) Foundations of Computing; (G) Computational Mathematics.

217A-217B. Computational Science (3-3) I, II. The Staff

Lecture—3 hours. Prerequisite: courses 205A and 205B (may be taken concurrently). Designed for physical scientists. Topics in computer science with applications to computational science. Computer organization and architecture, data structures, algorithms and complexity, software environments for scientific visualization, symbolic computation.

218A. Signal Processing (3) I. The Staff
Lecture—3 hours. Prerequisite: Mathematics 185A, 121A-121B. Discrete-time and continuous-time signal processing. Fourier transforms, Laplace transforms, sampling and reconstruction, linear time-invariant systems, signal space concepts, and probability and random processes. Offered in alternate years.

218B. Signal Processing (3) III. The Staff
Lecture—3 hours. Prerequisite: course 218A. Systems and signals, convolution, causality, and stability. Z-transform, DTFT, DFT IIR, and FIR filters. Adaptive filters, array signal processing, spectral estimation, and image processing. Offered in alternate years.

220. Artificial Neural Networks (3) III. Vemuri

Lecture—3 hours. Prerequisite: Mathematics 167. Introduction to artificial neural networks. Content addressable memory, interaction, competition, and resonance. LMS and back propagation algorithms. Comparisons of standard models including perceptrons, multilayered and Hopfield nets. Supervised and unsupervised learning. Offered in alternate years.

222. User Interfaces (3) II. The Staff

Lecture—3 hours. Prerequisite: courses 101, 106. Design and evaluation of the interface between systems and users. Covers user interaction styles and techniques, display formats, user guidance, and methodologies for designing and evaluating user interfaces. Offered in alternate years.

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.

227. Chaos, Fractals, and Nonlinear Dynamics (3) III. Hoover

Lecture—3 hours. Prerequisite: course 115. Computational treatment of the mathematics of pervasive instabilities — sensitive dependence on initial conditions — called "chaos" link the Second Law of Thermodynamics to nonlinear dynamics. Strange attractors which result are generally fractal objects with great aesthetic and intellectual appeal.

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. 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.

255. Classical Mechanics (3) I. Newcomb
Lecture—3 hours. Prerequisite: consent of instructor. General principles of analytical mechanics; variational principles; Lagrange's and Hamilton's equations; kinematics; collisions.

256. Continuum Mechanics (3) II. Christensen
Lecture—3 hours. Prerequisite: course 205C. Hydrodynamics of incompressible and compressible flows in two and three dimensions; problems of hydrodynamic instability; viscous hydrodynamics; boundary layer theory.

257. Magnetohydrodynamics (3) III. Newcomb
Lecture—3 hours. Prerequisite: course 234B. Fundamental MHD equations, MHD waves (both linear and nonlinear), shocks, Lagrangian formulation; theory of stability, gyroscopic effects, finite-resistivity effects.

262A-262B-262C. Atomic and Molecular Interactions (3-3-3) I-II-III. Orel

Lecture—3 hours. Prerequisite: course 230A-230B-230C or the equivalent. Atomic structure and spectra, molecular structure and spectra, classical and quantum mechanical collision theory of electron and heavy particle scattering.

265A-265B. Laser Physics (3-3) I-II. Haas
Lecture—3 hours. Prerequisite: courses 230A-230B-230C, 234A-234B-234C. Theory of generation of laser radiation and its interaction with matter. Dynamics of laser media, oscillators/amplifiers. Short pulse generation and propagation. Coherence properties of laser radiation. Fourier optics, resonators, and holography. Characteristics of laser devices. Laser spectroscopy.

266A-266B. Laser Physics Laboratory (3-3) I-II. 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.

260A-260B-260C. 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; sin-

gle particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov Theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff (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.)

Engineering: Chemical

(College of Engineering)

Brian G. Higgins, Ph.D., Chairperson of the Department

Department Office, 3092 Balmer Hall (916-752-0400; FAX: 916-752-1031)

Faculty

Richard L. Bell, Ph.D., Professor

Roger B. Boulton, Ph.D., Associate Professor
(*Chemical Engineering, Viticulture and
Enology*)

Brian G. Higgins, Ph.D., Professor

Alan P. Jackman, Ph.D., Professor

David F. Katz, Ph.D., Professor (*Chemical
Engineering; Obstetrics and Gynecology*)

Benjamin J. McCoy, Ph.D., Professor

Karen A. McDonald, Ph.D., Assistant Professor

Ahmet N. Palazoglu, Ph.D., Associate Professor

Robert L. Powell, Ph.D., Professor

Dewey D.Y. Ryu, Ph.D., Professor (*Chemical
Engineering*)

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, Engineering 35. Fluid statics and one-dimensional laminar flows. Kinematics of point and integral functions. The stress vector-stress tensor relation. Newton's law of viscosity and application of the Navier-Stokes equations to laminar flow and dimensional analysis. Flow of non-Newtonian fluids. Not open for credit to students who have completed Engineering 103A.

150B. Chemical Engineering Fluid Mechanics (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Turbulent flows and time averaging. Application of Bernoulli's equation and the macroscopic mass, momentum, and mechanical energy balances to a variety of practical problems. Introduction to compressible flow. The entropy equation and isentropic processes. Shock waves and choke flow. Not open for credit to students who have completed Engineering 103B or Civil Engineering 141.

151. Material Balances (3) I. Whitaker

Lecture—3 hours. Prerequisite: Chemistry 110A, Chemistry 128B (may be taken concurrently), Engineering 5. Application of the principles of conservation of mass to single and multi-component systems in chemical process calculations. Studies of batch, semi-batch, and continuous processes involving mass transfer, change of phase, and chemical reaction.

152A. Chemical Engineering Thermodynamics (3) II. The Staff

Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes. Not open for credit to students who have completed Engineering 105A.

152B. Chemical Engineering Thermodynamics (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 152A. Continuation of course 152A. Not open for credit to students who have completed Engineering 105B.

153. Chemical Engineering Heat Transfer (4) III. The Staff

Lecture—4 hours. Prerequisite: course 150A. Steady and transient heat conduction. The thermal energy equation, analysis of forced and free convective heat transfer. Turbulence, macroscopic balances, and heat transfer coefficients. The photon transport equation and radiant energy exchange. The design of heat exchangers.

154A. Mass Transfer (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 153, Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer.

154B. Applications of Mass Transfer (3) II. The Staff

Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation, and other separation processes.

155A. Chemical Engineering Laboratory (4) I, II. The Staff

Laboratory—12 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics.

155B. Chemical Engineering Laboratory (4) II, III. The Staff

Laboratory—12 hours. Prerequisite: courses 154B, 155A. Continuation of 155A.

156A. Chemical Engineering Kinetics (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.

156B. Chemical Engineering Kinetics (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 156A. Continuation of course 156A.

157. Process Dynamics and Control (3) I. McDonald

Lecture—3 hours. Prerequisite: course 159. Fundamentals of dynamic modelling of chemical processes. Design and analysis of classical feedback control of chemical processes.

157L. Process Control Laboratory (1) II, III. The Staff

Laboratory—3 hours; discussion—1 hour. Prerequisite: course 157. Laboratory experiments in control system design and analysis.

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

206. Biochemical Engineering (3) II. Ryu

Lecture—3 hours. Prerequisite: course 161 and Microbiology 2, 3; Biochemistry and Biophysics 101A, 101B, and Food Science and Technology 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 alternate years.

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 alternate years.

246. Advanced Biochemical Engineering (2) III. Ryu
Lecture—2 hours. Prerequisite: course 161, Chemical Engineering 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. 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. Stroev

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.

256. 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 particle systems in pollution abatement and chemical process equipment. Microorganisms, crystallization, aerosols, hydrosols, colloids. Distribution functions, population balances, rarefied gas phenomena, concentration polarization in reverse osmosis and filtration. Offered in alternate years.

261. Separation Processes: Column Operations (3) III. McCoy

Lecture—3 hours. Prerequisite: course 154B. Analysis and design of chemical separation processes: distillation, extraction, chromatography, adsorption. Finite difference equations, unified design methods, axial dispersion models, probability and random walk theories, method of characteristics, moment analysis, optimization. Offered in alternate years.

262. Transport Phenomena in Multiphase Systems (3) III. Whitaker

Lecture—3 hours. Prerequisite: course 253C. Heat, mass, and momentum transfer in multiphase, 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 properly invariant constitutive equations. Topics include: viscometry, linear and nonlinear viscoelasticity, continuum mechanics, kinetic theory. Offered in alternate years.

264. Introduction to Hydrodynamic Stability Theory (4) III. Higgins

Lecture—4 hours. Prerequisite: course 253A. Mathematical structure for studying the stability of fluid motions. Introduction to bifurcation theory and the spectral problem for linear stability. Offered in alternate years.

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 alternate 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 adsorption and reaction, and heat transfer in multiphase systems with chemical reaction. (S/U grading only.)

292. Seminars in Process Dynamics and Control (1) II. Palazoglu

Seminar—1 hour. Prerequisite: graduate or senior standing. Theoretical and practical aspects of process control will be addressed. Topics will cover controller analysis and synthesis of linear and nonlinear systems including bioreactors, distillation columns and others as well as dynamic modeling of such processes. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Course

390. Teaching of Chemical Engineering (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: qualifications and acceptance as teaching assistant and/or associate-in in chemical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

Engineering: Civil

(College of Engineering)

Melvin R. Ramey, Ph.D., Chairperson of the Department (916-752-0586)

Daniel P. Y. Chang, Vice-Chairperson of the Department (916-752-0586)

Department Office, 206 Walker Hall (916-752-0586)

Faculty

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Takashi Asano, Ph.D., Adjunct Professor
Don O. Brush, Ph.D., Professor
Robert H. Burgy, M.S., Professor Emeritus (*Civil Engineering; Land, Air and Water Resources*)

Daniel P. Y. Chang, Ph.D., Professor
James A. Cheney, Ph.D., Professor Emeritus
Yannis F. Dafalias, Ph.D., Professor
Jeannie L. Darby, Ph.D., Assistant Professor
Johannes J. DeVries, Ph.D., Adjunct Lecturer
Leonard R. Herrmann, Ph.D., Professor
James R. Hutchinson, Ph.D., Professor (*Graduate Adviser*)

I.M. Idriss, Ph.D., Professor
William K. Johnson, M.S., Lecturer
Paul P. Jovanis, Ph.D., Associate Professor
M. Levent Kavvas, Ph.D., Professor
Ian P. King, Ph.D., Professor
Ryuichi Kitamura, Ph.D., Professor
Ray B. Krone, Ph.D., Professor Emeritus
Bruce L. Kutler, Ph.D., Associate Professor
Bruce E. Larock, Ph.D., Professor
Jay R. Lund, Ph.D., Assistant Professor
Miguel A. Marfio, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)

Kyran D. Mish, Ph.D., Assistant Professor
Patricia L. Mokhtarian, Ph.D., Assistant Professor
Gerald T. Oriob, Ph.D., Professor Emeritus
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 Emeritus (*Civil Engineering; Land, Air and Water Resources*)

Chih-Kang Shen, Ph.D., Professor Emeritus
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. (CAN Engr 10)

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, environmen-

tal 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)

Internship. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work experience in civil engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

114. Probabilistic Systems Analysis for Civil Engineers (3) I, II. 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) I, 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.

140. Environmental Analysis of Aqueous Systems (3) I. Darby

Lecture—3 hours. Prerequisite: Chemistry 1B; course 140L concurrently. Introduction to principles underlying current practices in sampling and analysis of water and wastewater.

140L. Environmental Analysis of Aqueous Systems Lab (1) I. Darby

Laboratory—3 hours. Prerequisite: course 140 concurrently. Introduction to laboratory practice in the examination of water and wastewater. "Wet chemical" and instrumental techniques.

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. Kawas

Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently), or the equivalent. Open to Engineering students only. Study of the hydrologic cycle. Frequency analysis of hydrologic variables. Precipitation analysis for hydrologic design. Evapo-transpiration, interception, depression storage and infiltration. Streamflow analysis. Flood routing through channels and reservoirs.

142L. Engineering Hydrology Laboratory (1) II. Kawas

Laboratory—3 hours. Prerequisite: course 142 (may be taken concurrently). Laboratory calculations and demonstrations of hydrologic processes, such as rainfall-runoff, storm characteristics and precipitation, evaporation and transpiration, infiltration, streamflow, and flood routing.

144. Groundwater Systems Design (3) I. Darby

Lecture—3 hours. Prerequisite: Engineering 5 and course 142 (may be taken concurrently); Applied Science Engineering 115 recommended. Groundwater occurrence, distribution, and movement; well-flow systems; design of wells; groundwater quality and contamination; aquifer management. Introduction to groundwater modeling.

145. Hydraulic Structure Design (3) III. DeVries

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 141, 141L, 142. Principles of project design. Methods of analysis and hydraulic design of storage systems, diversion structures, conveyance and regulation systems, and structures for irrigation, power, and flood control projects. Emphasis is on application of principles of open channel hydraulics in these systems.

146. Water Resources Simulation (3) II. Lund

Lecture—3 hours. Prerequisite: course 142. Simulation techniques in the design and operation of water resources projects; introduction to simulation theory, testing, and application to surface and groundwater problems and system analysis.

147. Solid Waste Management (3) I. Tchobanoglous
Lecture—2 hours; laboratory—3 hours. Characteristics and amounts of solid wastes; collection systems; introduction to waste treatment processes and return of treated wastes to the environment.

148A. Water Quality Management (3) II, III. Schroeder

Lecture—3 hours. Prerequisite: Engineering 103A. Open to Engineering students only. Introduction to basic concepts of water quality. Fundamentals of water and wastewater treatment processes. Analysis of treatment process flowsheets. Analysis of water quality management alternatives.

148B. Water Quality Management Systems Design (3) III. Tchobanoglous

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 148A (may be taken concurrently). Introduction to the design of water and wastewater treatment processes.

149. Introduction to Air Pollution (3) I. Carroll

(Land, Air and Water Resources), Chang, Raabe
Lecture—3 hours. Prerequisite: Mathematics 22B, 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 149.)

152. Introduction to Civil Engineering Planning (3) I. The Staff

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 and Design (3) I. Lund

Lecture—3 hours. Prerequisite: Mathematics 21C, 22A, and Engineering 5 or the equivalent. Introduction to operations research. Optimization techniques such as linear programming, dynamic programming, and non-linear programming. Applications in water resources planning, transportation planning, systems engineering, and other civil engineering disciplines through computer-based design projects.

154. Probabilistic Design and Optimization (3) II. Lund

Lecture—3 hours. Prerequisites: courses 114 and 153, and Engineering 106, or the equivalents. Design by optimization for probabilistic systems, decision theory, the value of information, probabilistic linear programming, probabilistic dynamic programming, nonlinear probabilistic optimization. Applications in civil engineering design, project evaluation, and risk management.

160. Introduction to Transportation Planning (3) I. Sperling

Lecture—3 hours. Prerequisite: any two of course 152, Geography 5, and Economics 1A. Transportation and associated environmental problems confronting urban areas, and prospective technological and institutional solutions. Draws upon concepts and analytical techniques from economics, engineering, political science, and environmental studies. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Geography 5.

161. Transportation System Operations (3) II. Jovanis

Lecture—3 hours. Prerequisite: Engineering 102A. Principles of transportation system operations; traffic characteristics and methods of measurement; safety and operations; models of transportation operations and congestion applied to urban streets, freeways, and mass transit services.

162. Transportation System Design (3) III. Jovanis
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 160 or 161 or 163. Human vehicle and guideway factors and their relationship to transportation system design. Generalized design paradigm; application to large scale group problem solving.

163. Energy and Environmental Aspects of Transportation (3) II. Sperling

Lecture—3 hours. Prerequisite: course 160 recommended. Application of engineering, economic, and system planning concepts. Analysis of energy, air quality, and other selected environmental attributes of transportation technologies. Investigation of strategies for reducing pollution and petroleum consumption, in light of institutional and political constraints. (Same course as Environmental Studies 163).

171. Soil Mechanics (4) II, III. Kutter

Lecture—4 hours. Prerequisite: course 104A (may be taken concurrently), course 171L (must be taken concurrently). Soil formations, mass-volume relationships, soil classification, effective stress, soil-water-void relationships, compaction, seepage, capillarity, compressibility, consolidation, strength, states of stress and failure.

171L. Soil Mechanics Laboratory (1) II, III. Kutter
Laboratory—3 hours. Prerequisite: course 171 must be taken concurrently. Laboratory studies utilizing standard testing methods to determine physical, mechanical and hydraulic properties of soil and demonstration of basic principles of soil behavior.

173. Foundation Design (4) I. Idriss

Lecture—4 hours. Prerequisite: courses 132B and 171, 171L. Soil exploration and determination of soil properties for design; consolidation and elastic settlements of foundations; bearing capacity of soils and footing design; lateral earth pressures and retaining wall design; pile foundations; excavations and dewatering.

174. Environmental Geotechnique (3) III. Arulanandan

Lecture—3 hours. Prerequisite: course 148A and 171. Soil and site characterization in relation to natural and man-made hazards, waste containment, and waste site remediation techniques.

176. Geotechnical Modeling (3) I. Kutter

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 171, 171L. Principles of similitude and the theory of models. Applications to soil mechanics and foundation engineering utilizing centrifugation. Instrumentation, calibration, computer-aided data reduction and recording. Experiments demonstrating basic principles, including bearing capacity, dynamic impact response, and liquefaction in earthquake.

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)

Internship. Prerequisite: upper division standing; approval of project prior to the period of the internship. Supervised work experience in civil engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: senior standing in engineering and at least a B average. (P/NP grading only.)

Graduate Courses

201. Introduction to Theory of Elasticity (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. The Staff

Lecture—3 hours. Prerequisite: courses 201 and 221. Analysis of the buckling behavior of structural members: buckling of columns, lateral buckling of beams, nonlinear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates.

203. Inelastic Behavior of Solids: 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 alternate years.

***204. Viscous Behavior of Solids (3) III.** Dafalias

Lecture—3 hours. Prerequisite: course 201. Fundamentals of theories of viscoelasticity and viscoplasticity for solids. Characterization of engineering materials, e.g., concrete, soil, asphalts, rubbers, etc. General analysis procedures for problems in viscoelasticity. Offered in alternate years.

205. Continuum Mechanics (3) II. 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 alternate 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. Mish

Lecture—3 hours. Prerequisite: Applied Science Engineering 115 or Mathematics 128A-128B (128B may be taken concurrently), or consent of instructor. Approximate analysis procedures; Galerkin and stationary principle methods. Construction of approximate solutions by the finite element method. Applications to one- and two-dimensional problems in engineering. Introduction to time dependent, non-linear and three-dimensional problems, and other approximation procedures.

212B. Finite Elements: Application to Linear and Nonlinear Structural Mechanics Problems (3) III. Herrmann

Lecture—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. Offered in alternate years.

213. Analysis of Structures Subjected to Dynamic Loads (3) III. Romstad

Lecture—3 hours. Prerequisite: courses 138, 211. Analysis of structures subjected to earthquake wind and blast loading; distributed, consistent and lumped mass techniques; development of a computer program for complex structures; nonlinear response spectrum analysis; frequency and time domain analysis.

221. Theory of Plates (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.

232. Advanced Topics in Concrete Structures (3) I. Ramey and Taylor

Lecture—3 hours. Prerequisite: course 132B. Ductility of reinforced concrete; design for torsion of structural concrete; seismic requirements; 2-way slabs.

233. Advanced Design of Steel Structures (3) II. Ramey and Taylor

Lecture—3 hours. Prerequisite: courses 132A and 131A. Design considerations for steel column and frame buckling; steel-plate girder design; steel-concrete composite design; design of connections. Design basis follows the AISC'S, LRFD, and ASD specifications.

240. Water Quality (3) II. Orlob

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.

242A. Air Quality (3) III. Chang

Lecture—3 hours. Prerequisite: Engineering 105A; courses 141 and 149, or the equivalent. Factors determining air quality. Effects of air pollutants. Physical and chemical fundamentals of atmospheric transport and reaction. Introduction to dispersion modeling.

***242B. Airborne Particles and Scavenging Mechanisms (3) I.** Raabe

Lecture—3 hours. Prerequisite: Engineering 103A, 105A, courses 141, 149; 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. Offered in alternate years.

***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. Offered in alternate years.

243A. Water and Waste Treatment (3) I. Schroeder

Lecture—3 hours. Prerequisite: course 148A. Characteristics of water- and airborne-wastes; treatment processes and process kinetics; treatment system design.

243B. Water and Waste Treatment (3) II. Schroeder
Lecture—3 hours. Prerequisite: course 243A; consent of instructor. Continuation of course 243A.

***244. Environmental Quality Modeling (3) III.** Orlob,
Lecture—2 hours; laboratory—3 hours. Prerequisite: one of courses 240, 241, or 242A. Mathematical modeling of environmental water quality, with emphasis on mathematical models of quality, their structure, capabilities and limitations, sensitivity and reliability as analytical and/or predictive tools. Offered in alternate years.

245. Applied Environmental Chemistry (3) III. Darby

Lecture—3 hours. Prerequisite: Engineering 105A; Chemistry 1A, 1B, or the equivalent; courses 140 and 140L or the equivalent; Chemistry 1C, 5, or 107A recommended. Chemistry of natural and polluted waters. Chemical kinetic and equilibrium principles, thermodynamics, carbonate systems, precipitation and dissolution, coordination chemistry, oxidation reduction, and interfacial phenomena.

246. Pilot Plant Laboratory (3) II. Darby
Lecture—1 hour; laboratory—6 hours. Laboratory investigation of physical, chemical, and biological processes for water and wastewater treatment.

248A. Design of Natural Systems for Wastewater Treatment (3) III. Smith

Lecture—2 hours; laboratory—3 hours. Prerequisite:

courses 243A, 243B. Procedures are presented for the design of natural aquatic and soil-based systems for treatment of municipal and industrial wastewaters. Emphasis is placed on the practical application of principles developed in core courses 243A and 243B plus new information related to natural systems. Offered in alternate years.

250. Urban Transportation and Land Use Policy and Planning (3) III. Mokhtarian

Lecture—3 hours. Prerequisite: course 251. Historical and current relationships between transportation and land use. Traditional land use models. Role of land use in urban transportation modeling. Relationship between energy consumption and urban form. Impact of telecommunications on urban form. Policies involving transportation/land use relationships.

***251. Transportation Demand Analysis (3) I.** Kitamura

Lecture—3 hours. Prerequisite: course 114 or the equivalent. Detailed discussions of a standard procedure used in urban passenger travel demand forecasting. Principles and assumptions of the model components (trip generation, trip distribution, and modal split). Computer exercises using empirical data to calibrate models and forecast travel demand. Offered in alternate years.

253. Transportation Safety Analysis (3) III. Jovanis

Lecture—3 hours. Prerequisite: course 114, 254. Human and vehicle factors in accident occurrence. Evaluation of safety investments; regression to the mean. Development of statistical models of accident occurrence. Offered in alternate years.

254. Discrete Choice Analysis of Travel Demand (3) II. Kitamura

Lecture—3 hours. Prerequisite: course 114 or the equivalent. Behavioral and statistical principles underlying the formulation and estimation of discrete choice models. Practical application of discrete choice models to characterization of choice behavior, hypothesis testing, and forecasting. Emphasis on computer exercises using large-scale data sets obtained from home interview surveys.

***255. Transportation Network Analysis (3) III.** Kitamura

Lecture—3 hours. Prerequisite: course 251. Discussions of methods for the analysis of transportation network flow and network optimization. Graphs and networks, flows on networks, shortest-path algorithms, equilibrium and stochastic traffic assignment, optimum routing, optimum facility location, and optimum network design are covered. Offered in alternate years.

256. Urban Traffic Management and Control I (3) II. Jovanis

Lecture—3 hours. Prerequisite: graduate standing. Nature of urban vehicular traffic congestion; roadway capacity; intersection design and traffic signal operations; freeway operations and management; corridor control.

***257. Urban Traffic Management and Control II (3) III.** Jovanis

Lecture—3 hours. Prerequisite: course 256. Microscopic and macroscopic traffic stream models; traffic signal delay models; queuing theory applications. Traffic surveillance and detection; traffic forecasting; applications to traffic control systems. Offered in alternate years.

258. Transportation Planning in Developing Countries (3) III. Sperling

Lecture—3 hours. Prerequisite: course 160 or consent of instructor. Investigation of the role that transportation investments and policies play in the development of regions and countries. Emphasis is on identifying appropriate technologies, policies, and planning methods for designing transportation systems in regions of differing socioeconomic, geographic, and institutional settings. Offered in alternate years.

259. Advanced Highway Technology and Automation (3) I. Jovanis, Kitamura

Lecture—3 hours. Prerequisite: graduate standing.

Technologies covered include vehicle navigation and guidance, telecommunications and information systems, and highway electrification. Analysis and evaluation of policy implementation issues, driver response and pricing strategies and costs, and formulation of control theory.

***260. Noncohesive Sediment Transportation (3) II.** The Staff

Lecture—3 hours. Prerequisite: course 141. Sediment materials. Particle suspension by currents, waves, and winds. Modes of transport. Bed load relations and suspended load relations. Calculation of total loads in streams. Similarity criteria for movable bed models. Stable channel design. Offered in alternate years.

***261. Cohesive Particle Transportation (3) III.** The Staff

Lecture—3 hours. Prerequisite: course 141. Cohesion; cohesive particulate materials; processes of aggregation and dispersion; aggregate properties; deposition and scour, channel and harbor design and maintenance. Offered in alternate years.

266A. Applied Stochastic Methods in Engineering (3) I. Kavvas

Lecture—3 hours. Markov processes and their applications to modeling of engineering systems. Review of differential Smolukowski-Chapman-Kolmogorov equations, Brownian motion and Ornstein-Uhlenbeck processes within the framework of statistical diffusion theory and their engineering applications to pollution transport problems.

266B. Applied Stochastic Methods in Engineering (3) II. Kavvas

Lecture—3 hours. Stochastic differential equations and their applications to the solution of engineering problems. Offered in alternate years.

267. Water Resources Management (3) I. Lund

Lecture—3 hours. Prerequisite: basic probability (course 114 or the equivalent) and courses 141 and 142; course 153 recommended. Operation, maintenance, and modification of existing water resource systems; engineering, economic, financial, legal, and institutional considerations; decision, optimization, and multi-objective analysis.

***268. Public Works Economics (3) II.** Lund

Lecture—3 hours. Prerequisite: Engineering 106 or Agricultural Economics 148; Economics 1A. Engineering economics applied to public works planning, operations, and maintenance problems; microeconomic and macroeconomic theories; benefit-cost analysis; effect of uncertainty; optimization economics; non-classical economics; public finance. Offered in alternate years.

269. Water Supply and Hydroelectric Power Planning (3) II. Johnson

Lecture—3 hours. Prerequisite: courses 142 and 152 or the equivalent. Analysis of drought phenomena and low streamflow; water demand; risk and reliability analysis; conjunctive supply and conservation; planning alternatives. Capacity and energy determination; operations studies; planning alternatives; market requirements and load studies; analysis of system power and supply; regulatory considerations. Offered in alternate years.

270. Advanced Water Resources Management (3) III. Lund

Lecture—3 hours. Prerequisite: courses 153 and 267 or the equivalent. Discussion of technical papers related to planning theory, system maintenance, regionalization, multi-objective methods, risk analysis, institutional issues, pricing, model application, economic development, forecasting, operations, and other topics.

***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. Offered in alternate years.

272A. Advanced Groundwater Hydrology (3) II.

Marino

Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 118A recommended. Flow in confined, unconfined, and leaky aquifers. Hydraulics of pumping and recharging wells. Identification of aquifer parameters. Groundwater quality problems.

272B. Advanced Groundwater Hydrology (3) III. King

Lecture—3 hours. Prerequisite: course 272A and 212A or the equivalent. Numerical methods of fluid flow systems. Flow in the unsaturated zone. Hydrodynamic dispersion. Fresh-water and salt-water interface in coastal aquifers. Identification of regional aquifer parameters. Modeling of aquifer systems. Offered in alternate years.

273. Water Resource Systems Engineering (3) I. Marino

Lecture—3 hours. Prerequisite: course 153, Mathematics 131 or Statistics 131A. Planning, design, and management of water resource systems. Application of deterministic and stochastic optimization techniques. Water allocation, capacity expansion, and design and operation of reservoir systems. Surface water and groundwater management.

274. Hydraulics of Pipe Lines (3) II. Larock

Lecture—3 hours. Prerequisite: course 141; Engineering 5. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Manifold flow. Offered in alternate years.

***275. Hydrologic Time-Series Analysis (3) III.** Kavvas

Lecture—3 hours. Prerequisite: Engineering 118 and course 142 or the equivalent. Application of statistical methods for analysis and modeling of hydrologic series. Statistical simulation and prediction of hydrologic sequences using time series methodology. Offered in alternate years.

276. Watershed Hydrology (4) II. Kavvas

Lecture—4 hours. Prerequisite: course 142 or the equivalent. Analysis and mathematical modeling of hydrologic processes taking place in a watershed. Precipitation analysis and modeling. Theory of overland flow and its kinematic wave approximation. Analysis and modeling of saturated and unsaturated subsurface flow processes taking place on a hill slope.

277. Unsteady Flow in Surface Waters (3) I. King

Lecture—3 hours. Prerequisite: course 141; Applied Science Engineering 115 (may be taken concurrently). Long waves in surface flow. Shallow water equations. Saint Venant equations. Method of characteristics. Explicit and implicit finite element methods; stability of numerical schemes. Flood routing. Bores. Dam break.

***278. Hydrodynamics (3) II.** Larock

Lecture—3 hours. Prerequisite: course 141. Equations for conservation of mass, momentum, energy; vorticity, circulation; stream functions, velocity potential; flows by superposition and conformal mapping; free streamline applications, gravity effects; Introduction to wave motion. Offered in alternate years.

***279. Advanced Mechanics of Fluids (4) I.** Larock

Lecture—4 hours. Prerequisite: course 141. Rotational flows. Navier-Stokes equations and solutions for laminar flow; boundary layer equations and solution techniques. Nature of turbulence. Reynolds equations. Introduction to turbulence modeling. Offered in alternate years.

281A. Advanced Soil Mechanics (3) I. Idriss

Lecture—3 hours. Prerequisite: course 171. Consolidation and secondary compression. Seepage and seepage pressures. Shear strength: friction, cohesion, dilatancy, and critical states.

281B. Advanced Soil Mechanics (3) II. Kutter

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 281A. Site investigation methods: CPT, SPT, pressuremeter, vane, seismic investigation, electrical properties. Slope stability, including seepage pressures and earthquake effects. Centrifuge modeling.

283. Physicochemical Influences and In Situ Evaluation of Soil Behavior (3) I. Arulanandan

Lecture—2 hours; laboratory—3 hours. Prerequisite:

course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal phenomena, ion-exchange, soil-water-electrolyte characteristics and soil structure. Laboratory includes methods of characterization of soils, quantification of soil structure, and rotating cylinder tests to evaluate soil erosion.

284. Theoretical Soil Mechanics (3) II. Kutter
Lecture—3 hours. Prerequisite: course 171, 281A. Elasticity, plasticity, and critical state soil mechanics. Prediction of stress-strain-volume change behavior of soils. Monotonic and cyclic loading, anisotropy, and strain-rate effects. Numerical implementation of constitutive models.

***285A. Soil Modification (3) I.** Idriss
Lecture—3 hours. Prerequisite: course 171. Purposes, principles, and methods of soil modification for various geotechnical applications. Offered in alternate years.

***285B. Pavement Systems Design (2) I.** Arulanandan
Lecture—2 hours. Prerequisite: course 171. Principles and methods of pavement design for highways and airfields. Offered in alternate years.

286. Advanced Foundation Design (3) III. Idriss
Lecture—3 hours. Prerequisite: course 173. Design and analysis of bulkheads; deep excavation; tie-back systems; coffer dams; loads on buried conduits; lateral pile loading capacity; pier foundations; and other related topics.

287. Geotechnical Earthquake Engineering (3) II. Idriss
Lecture—3 hours. Prerequisite: course 138, 281A. Characteristics of earthquake ground motions; empirical and simulation procedure for estimating these motions; local site response; liquefaction potential; residual strength and stability consideration; generation and dissipation of pore water pressures; settlement.

288. Earth and Rockfill Dams (3) III. Idriss
Lecture—3 hours. Prerequisite: course 281A, 281B. Site selection; preliminary design considerations; layout; seismic effects including considerations of fault movements; construction; instrumentation; maintenance.

289A-I. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of special topics with separate sections in (A) Environmental Engineering; (B) Hydraulics and Hydrologic Engineering; (C) Engineering Planning; (D) Geotechnical Engineering; (E) Structural Engineering; (F) Structural Mechanics; (G) Transportation Engineering; (H) Transportation Planning; (I) Water Resources Engineering. May be repeated for credit.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study. Course required of graduate degree candidates. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. Chairperson in charge
Discussion—1 hour. Research problems, progress, and techniques in civil engineering. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Civil Engineering (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Civil Engineering. Participation as teaching assistant or associate-in in 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

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Tsu-Shuan Chang, Ph.D., Associate Professor

John N. Churchill, Ph.D., Professor

K. Wayne Current, Ph.D., Professor

Andrew J. Dienes, Ph.D., Professor

Richard C. Dorf, Ph.D., Professor (*Electrical Engineering and Computer Science/Management*)

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Stephen B. Haley, Ph.D., Professor

Jonathan P. Heritage, Ph.D., Professor

I. Horowitz, Ph.D., Professor Emeritus

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Robert M. Keller, Ph.D., 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., Professor

Biswanath Mukherjee, Ph.D., Assistant Professor

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Arvin Park, Ph.D., Assistant Professor
Armand E. Prieditis, Ph.D., Assistant Professor
Arvind Raghunathan, 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. Matloff, Redinbo

Lecture—3 hours; computer workshop—3 hours. Prerequisite: Computer Science Engineering 30 or 35. Introduction to computer architecture; machine language; assembly language; macros and conditional macros; subroutine/parameter passing; input/output programming, interrupt and trap; direct-memory access; absolute and relocatable code; re-entrant code; program development in an operating system.

89A-U. Special Topics in Electrical Engineering and Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science, (B) Programming Systems, (C) Digital Systems, (D) Communications, (E) Signal Transmission, (F) Digital Communication, (G) Control Systems, (H) Robotics, (I) Signal Processing, (J) Image Processing, (K) High-Frequency Phenomena and Devices, (L) Solid-State Devices and Physical Electronics, (M) Systems Theory, (N) Active and Passive Circuits, (O) Integrated Circuits, (P) Computer Software, (Q) Computer Engineering, (R) Microprocessing, (S) Electronics, (T) Electromagnetics, (U) Opto-Electronics. May be repeated for credit when the topic is different.

92. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)

Internship—3-15 hours. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work experience in Electrical and Computer Science 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: courses 70, 112, 140A, Engineering 100; course 111A concurrently; course 140B concurrently recommended. Large and small signal 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; course 111B concurrently; course 140B recommended. Analysis and design of multi-stage and feedback amps; op-amp limitations and applications; active filters; oscillators; digital switches.

111A. Electronic Circuits Laboratory (1) II. Spencer, Hurst

Laboratory—3 hours. Prerequisite: courses 112, 140A, Engineering 100; course 110A concurrently; course 140B concurrently recommended. Design, analysis, and evaluation of transistor circuits, amplifiers, and op-amps.

111B. Electronic Circuits Laboratory (1) III.

Spencer, Hurst

Laboratory—3 hours. Prerequisite: courses 110A, 111A, 112; course 110B concurrently; course 140B recommended. Design, analysis and evaluation of multi-stage and feedback amps, oscillators and switching circuits.

112. Linear Systems and Circuits (4) I. Abdel-Ghaffar, Levy, Ford, 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.

114. Analog Integrated Circuits (3) I. Hurst, Spencer, Current

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110B, 111B, 140B. Analysis and design of analog integrated circuits. Emphasis is on bipolar transistor circuits. Single-stage amplifiers, cascaded amplifier stages, current sources, differential pair, frequency response, and feedback amplifiers. (Former course 114A)

118. Digital Integrated Circuits (3) III. Hurst, Current

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110B, 111B, 140B. Analysis and design of digital integrated circuits. Emphasis is on MOS logic circuit families. Logic gate construction, voltage transfer characteristics, and propagation delay. Regenerative circuits, RAMs, ROMs, and PLAs. (Former course 114B.)

130A. Introductory Electromagnetics (3) II. Dienes, Fink, Knoesen

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C; Physics 9C strongly recommended. Static electric and magnetic fields; time-varying electromagnetics.

130B. Introductory Electromagnetics (3) III. Fink, Dienes, Knoesen

Lecture—3 hours. Prerequisite: course 130A and Engineering 17. Plane electromagnetic waves, transmission, reflection. Transmission lines. Not open for credit to students who have completed course 139.

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 analy-

sis, 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.

135. Optical Communications I: Fibers (3) II.

Dienes, Knoesen

Lecture—3 hours. Prerequisite: course 130B or 139. Principles of optical communication systems. Dispersion broadening of pulses. Planar dielectric guides. Optical fibers: single-mode, multi-mode, step and graded index. Attenuation and dispersion limitations. Design of zero dispersion fibers. Offered in alternate years.

139. Fields and Waves for Computer Majors (4) III.

Dienes

Lecture—4 hours. Prerequisite: Mathematics 22B, 22C; Physics 9C. Static electric and magnetic fields. Electromagnetic waves and transmission lines. Not open for credit to students who have completed course 130B.

140A. Fundamental Principles of Device Physics (3) I. Bower, Churchill, Haley, Hunt

Lecture—3 hours. Prerequisite: Physics 9C. Semiconductor device fundamentals, equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, density of states, electrons and holes, p-n junctions, Schottky junctions, and junction field effect transistors.

140B. Fundamental Principles of Device Physics (3) II. Bower, Churchill, Haley, Hunt

Lecture—3 hours. Prerequisite: course 140A. Electrical properties, design, and models for Bipolar and MOS devices.

145A. Solid-State Electronics (3) III. Bower, Churchill, Haley, Soohoo, Hunt

Lecture—3 hours. Prerequisite: course 140B. Physical properties of electronic materials.

145B. Solid-State Electronics (3) I. Churchill, Soohoo, Haley, Hunt

Lecture—3 hours. Prerequisite: course 145A. Magnetic properties of solids. 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.

146A. Integrated Circuits Fabrication (3) I. Hunt, Bower

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 140B. Basic fabrication processes for metal oxide semiconductor (MOS) integrated circuits. Laboratory assignments covering oxidation, photolithography, impurity diffusion, metallization, wet chemical etching, and characterization work together in producing metal-gate PMOS test chips which will undergo parametric and functional testing. (Formerly course 115A.)

146B. Advanced Integrated Circuits Fabrication (3) II. Hunt, Bower

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 146A. Fabrication processes for CMOS VLSI. Lab projects examine deposition of thin films, ion implantation, process simulation, anisotropic plasma etching, sputter metallization, and C-V analysis. Topics include isolation, projection alignment, epilayer growth, thin gate oxidation, and rapid thermal annealing. (Former course 115B.)

148. Superconductivity (3) III. Fink

Lecture—3 hours. Prerequisite: course 130A and 140A. Fundamental properties of superconductors of the first and second kind, London and Ginzburg-Landau theories, Josephson effects, applications and devices.

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, Friedlander, Mayne, 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) III. 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. Dorf, Gundes, Mayne, Wang

Lecture—3 hours. Prerequisite: course 112. Analysis and design of feedback control systems. Examples are drawn from electrical and mechanical systems as well as other engineering fields. Mathematical modeling of systems, stability criteria, root-locus and frequency domain design methods.

157B. Control Systems (3) III. Hsia, Dorf

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Control system optimization and compensation techniques, digital control theory. Laboratory includes Servo system experiments and computer simulation studies.

160. Signal Analysis and Modulation (3) I, III.

Algazi, Feher, Ford, Gardner, Levy

Lecture—3 hours. Prerequisite: course 112. Signal analysis based on Fourier methods. Fourier series and transforms; time-sampling, convolution, and filtering; autocorrelation and spectral density; modulation: carrier-amplitude, carrier-frequency, and pulse-amplitude.

161. Signal Processing (3) II. Ford, Reed

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 151, 160; 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. Modulation, Coding, and Noise (3) II. Algazi, Ford, Gardner, Levy

Lecture—3 hours. Prerequisite: course 160; Statistics 120. Introduction to random process models of modulated signals and noise, and analysis of receiver performance. Analog, carrier, and digital pulse modulation. Signal-to-noise ratio, probability of error, matched filters, and Wiener filters. Introduction to information theory and coding.

***166. Digital Communications: Satellite, Microwave, Cable (3) III.** Feher

Lecture—3 hours. Prerequisite: course 160. Introduction to digital communications by satellite, microwave, and cable systems. Baseband signal processing techniques for digital MODEMS (modulators-demodulators). Principles and applications of QPSK, 64-QAM, and other MODEMS in TDMA and SCPC satellite and terrestrial microwave systems.

167. Telecommunications Measurements and Instrumentation (3) I. Feher

Lecture—3 hours. Prerequisite: course 160. Measurements and instrumentation for digital communications and signal processing systems. Analysis of bit error rate, noise and jitter measurement uncertainties. Digitized PCM voice and video spectral and time measurements. Expert (artificial intelligence) applications. In-class experiments/demonstrations.

171. Introduction to Computer Architecture (4) I, II, III. Matloff, Park, Redinbo, Wilken

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, Chang

Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 70, 176; course 177 (concurrently) recommended. 8086/8088 microprocessor architecture; bus-based system architecture; peripheral chips architecture; I/O interface design; Interrupt driven system design; general system design procedure; MS-DOS operating system; comparison of different types of microprocessors.

***175. Computer Devices and Systems (3) III.** Soohoo

Lecture—3 hours. Prerequisite: course 140B. 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) I, 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. Multi-input/output sequential digital systems; time/pulse circuits; TTL, CMOS, ECL logic elements; analog switch; sample/hold; A-D-A converters design; system noise: grounding, shielding, cross-talk, reflection; memory systems; CAD with PLD/PAL.

182A. Operating System Design (4) I. Ruschitzka

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 171. 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. Not open for credit to students who have completed Computer Science Engineering 150.

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-U. Special Topics in Electrical Engineering and Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science; (B) Programming Systems; (C) Digital Systems; (D) Communications; (E) Signal Transmission; (F) Digital Communication; (G) Control Systems; (H) Robotics; (I) Signal Processing; (J) Image Processing; (K) High-Frequency Phenomena and Devices; (L) Solid-State Devices and Physical Electronics; (M) Systems Theory; (N) Active and Passive Circuits; (O) Integrated Circuits; (P) Computer Software; (Q) Computer Engineering; (R) Microprocessing; (S) Electronics; (T) Electromagnetics; (U) Opto-Electronics. May be repeated for credit when topic is different.

190C. Research Group Conferences in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing in Electrical and Computer 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)

Internship—3-15 hours. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work experience in electrical and computer engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

201. Digital Processing of Signals (4) II. Algazi,

Friedlander, Ford

Lecture—4 hours. Prerequisite: course 151. Theory and applications of digital processing of signals. Z-transform analysis of discrete-time systems, filter design techniques, structures for discrete-time systems, discrete Fourier transform, and Hilbert transforms. (Former course 204.)

205. Introduction to Optical Information Processing (3) II. Knoesen

Lecture—3 hours. Prerequisite: courses 230 and 250 recommended. Review of the scalar theory of diffraction and of two-dimensional Fourier transforms, from which the foundations of the frequency analysis of imaging systems will be developed. Image processing techniques will be examined, including the theory and application of holography. Introduction to optical computing. Offered in alternate years.

206. Digital Image Processing (4) II. Algazi, Ford, Reed

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 151. Two-dimensional systems theory, image perception, sampling and quantization, transform theory and applications, enhancement, filtering and restoration, image analysis, and image processing systems.

207. Pattern Recognition and Classification (3) III. Ford, Reed

Lecture—3 hours. Prerequisite: Statistics 120. Topics in statistical pattern recognition and classification: linear decision functions and minimum distance classification, Bayes decision theory, clustering algorithms, the generalized perceptron, multi-layer neural networks, and feature extraction.

208. Image Analysis and Computer Vision (3) III. Algazi, Levy, Reed

Lecture—3 hours. Prerequisite: course 151. Geometry of two-dimensional objects. Edge detection and image segmentation. Image formation and fundamental principles of computer vision. Recovery of three-dimensional structure from shading or stereo information. Analysis of motion and estimation of motion parameters. Geometry and representation of three-dimensional objects.

210. Analog Circuit Design (3) I. Spencer, Current, Hurst

Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B, and 140B. Analysis and design of amplifiers, bias circuits, voltage references and other analog circuits. Feedback and compensation of linear amplifiers. Computer-aided analysis is used extensively.

211. Advanced Analog Circuit Design (3) I. Spencer, Current, Hurst

Lecture—3 hours. Prerequisite: course 210; Statistics 131A or the equivalent recommended. Noise in electronic circuits and systems. Distortion analysis; the translinear principle and its application to circuit analysis and synthesis; phase-locked loops and their applications.

212. Analog MOS IC Design (3) II. Hurst, Spencer, Current

Lecture—3 hours. Prerequisite: course 210. 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. Prerequisite: courses 110A-110B, 111A-111B; knowledge of FORTRAN or C. Network equation formulations; nonlinear dc and linear ac circuit analysis. Calculation of dc and ac network sensitivities. Extensive computer project.

***214B. Computer-Aided Circuit Analysis and Design (3) II.** Current, Haley

Lecture—3 hours. Prerequisite: course 214A. Transient (time-domain) analysis; harmonic analysis; steady-state analysis; time-domain network sensitivities, ac, dc, transient gradient calculations, design optimization. Extensive computer project.

218A. Introduction to VLSI Circuits (3) I. Current, Hurst, Spencer

Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B. Theory and practice of VLSI circuit and system design. Extensive use of VLSI computer-aided design aids allows students to undertake a VLSI design example.

218B. Multiproject Chip Design (1) II. Current, Hurst, 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 218A and 218B. Chips submitted in course 218B are tested and evaluated. Issues involving design of ICs for testability are discussed.

219. Advanced Digital Circuit Design (3) III. Hurst, Current, Spencer

Lecture—3 hours. Prerequisite: course 118 or 218A. Analysis and design of digital circuits. Both bipolar and MOS circuits are covered. Dynamic and static RAM cells and sense amplifiers. Advanced MOS families. Multivalued logic.

220. Semiconductor Devices (3) II. Churchill, Bower, Hunt

Lecture—3 hours. Prerequisite: course 140B. Covers the physical principles, characteristics and models of various semiconductor devices including: P-N Junction and metal-insulator-semiconductor diodes, junction and insulated gated field effect transistors.

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) I. Dienes

Lecture—3 hours. Prerequisite: courses 130B and 140B. 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 sat-

uration; transient behavior of electric dipole transitions, coupled amplitude equations and rate equations. Offered in alternate years.

226B. Quantum Electronics (3) II. Dienes

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 alternate years.

***227A. Microwave Electronics (3) I.** Soohoo

Lecture—3 hours. Prerequisite: courses 130B and 140B. Theory of microwaves, waveguides and cavities. Interaction between electromagnetic fields and the electron charge. Lorentz force law, energy levels in matter and Zeeman splitting. Comparison between conventional and microwave tubes and other new types of microwave oscillators and amplifiers. Offered in alternate years.

***227B. Microwave Electronics (3) II.** 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 alternate 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, beamformers, tapered networks. Youla's broadband matching theory applied to microwave devices. Antenna design, analysis of horns, microstrip, log periodic, arrays, spirals and reflectors. Offered in alternate years.

230. Electromagnetics (3) I. Dienes, Fink

Lecture—3 hours. Prerequisite: course 130B. Maxwell's equations, plane waves, reflection and refraction, waveguides, waves in anisotropic media, propagation in dispersive media, laser beams and resonators.

***231. Electromagnetic Theory (3) II.** Dienes, Fink
Lecture—3 hours. Prerequisite: course 131B; Applied Science Engineering 234A. 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. Offered in alternate years.

240. Quantum Mechanics (3) I. Churchill, Fink, Haley

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, Haley, Hunt

Lecture—3 hours. Prerequisite: course 140B. Physics of solids relevant to solid-state applications. Topics include conduction mechanisms in semiconductors and transport phenomena in semiconductors, and polarization and magnetism in solids.

245B. Applied Solid-State Physics (3) III. Churchill, Soohoo, Haley, Hunt

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.** Soohoo

Lecture—3 hours. Prerequisite: course 245A. Theory of magnetism in solids, with application to ferromagnetic devices and circuits. Topics include paramag-

netism, ferromagnetism, magnetic resonance, and switching properties of individual magnetic elements and magnetic arrays.

246. Advanced Projects in IC Fabrication (3) III.

Current, Hunt, Spencer, Smith
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 146B. Individualized projects in the fabrication of analog or digital integrated circuits. (Former course 215.)

***247. Advanced Semiconductor Devices (3) I.** Churchill, Bower, Hunt

Lecture—3 hours. Prerequisite: course 220. Physics of various semiconductor devices, including metal-oxide-semiconductor field-effect transistors (MOS-FETs), IMPATT and related transit-time diodes, transferred-electron devices, light-emitting diodes, semiconductor lasers, photodetectors, and solar cells. Offered in alternate years.

248. Microsensor Design and Fabrication (3) III.

Smith, Bower
Lecture—3 hours. Prerequisite: graduate standing in Engineering. Design and fabrication of sensors using microfabrication techniques. Topics include transduction principles, fabrication technologies specific to microsensors, and design of microsensor systems, including packaging. Offered in alternate years.

***249. Microfabrication (3) III.** Hunt

Lecture—3 hours. Prerequisite: graduate standing in Engineering. Theory and practices of several major technologies of microfabrication, used for producing integrated circuits, sensors, and microstructures. Major topics include sputtering, chemical vapor deposition, plasma processing, micromachining, and ion implantation. Offered in alternate years.

250. Linear Systems and Signals (4) I. Chang, Gundes, Levy, Wang,

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. Gundes

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.

252. Multivariable Control System Design (3) II.

Mayne, Wang
Lecture—3 hours. Prerequisite: course 250. Review of single-loop feedback design. Stability, performance and robustness of multivariable control systems. LQG design. H_{∞} design. Frequency response methods. Optimization-based design.

253. Adaptive Systems (3) I. Hsia

Lecture—3 hours. Prerequisite: 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) III. Hsia, Chang

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 alternate 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.

257. Topics in Optimization (3) III. The Staff

Lecture—3 hours. Prerequisite: graduate standing. Advanced topics in the theoretical foundations of

optimization and its applications, such as: linear and nonlinear systems theory, stochastic programming, stochastic optimal control, approximation theory for optimization, advanced topics in numerical implementation of algorithms, shape optimization, large scale optimization, semi-infinite and nondifferentiable optimization with applications to engineering design, global optimizations. (Same course as Mathematics 257.)

258A. Optimization I (3) II. The Staff

Lecture—3 hours. Prerequisite: knowledge of FORTRAN or C. Modeling optimization problems existing in engineering design and other applications, optimality conditions, linear programming and unconstrained optimization (gradient, Newton, conjugate directions and minimax algorithms), convergence and rate of convergence, selected topics. (Same course as Mathematics 258A.)

258B. Optimization II (3) III. The Staff

Lecture—3 hours. Prerequisite: course 258A. Modeling constrained optimization problems existing in engineering design and other applications, optimality conditions, linearly and nonlinearly constrained optimization problems, projection, feasible directions and reduced gradient algorithms, interior point methods, Lagrangian theory, duality, augmented Lagrangians, sequential quadratic programming, selected topics. (Same course as Mathematics 258B.)

259. Optimal Control, Theory and Algorithms (3) III. Chang, Mayne

Lecture—3 hours. Prerequisite: graduate standing. Optimal control and calculus of variations; existence of solutions to optimal control problem; necessary conditions of optimality, Pontryagin maximum principle, Euler equation; sufficient conditions of optimality, Hamilton-Jacobi-Bellman equation, linear quadratic regulator problem; algorithms for unconstrained and constrained optimal control problems. (Same course as Mathematics 259.)

***260. Random Signals and Noise (4) II.** Gardner

Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 120, course 160; course 250 recommended. Random processes as probabilistic models for signals and noise. Review of probability, random variables, and expectation. Study of correlation function and spectral density, ergodicity and duality between time averages and expected values, filters and dynamical systems. Applications.

262. Spectral Analysis (4) 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.

263. Optimal and Adaptive Filtering (3) III. Friedlander, Gardner, Levy

Lecture—3 hours. Prerequisite: course 260. Geometric foundation for mean-square estimation problems. Theory and applications of optimum Wiener filtering, optimum Kalman filtering, and adaptive estimation.

264. Estimation and Detection of Signals in Noise (4) III. Friedlander, Gardner, Levy

Lecture—3 hours; discussion—1 hour. Prerequisite: course 260. Introduction to parameter estimation and detection of signals in noise. Bayes and Neyman-Pearson likelihood-ratio tests for signal detection. Maximum-likelihood parameter estimation. Detection of known and Gaussian signals in white or colored noise. Applications to communications, radar, signal processing.

266. Information Theory and Coding (3) II. Algazi, Abdel-Ghaffar

Lecture—3 hours. Prerequisite: Statistics 120. Information theory and coding. Measure of information. Redundancy reduction encoding of an information source. Capacity of a communication channel, error-free communications. Linear block and convolutional codes.

***267. Digital Communications Engineering (3) I.**

Feher

Lecture—3 hours. Prerequisite: course 260. 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 260 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.

270. Computer Architecture (3) II. Redinbo

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) II.** Lin

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 177. Topics in advanced design of arithmetic processors. High-speed addition, multiplication, and division. Floating point processors. Pipeline processors. Laboratory involving design and construction of several example systems.

***273. Bit-Slice Microprocessor Systems (3) II.** 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. Offered in alternate years.

***274. Parallel Computer Architectures (3) III.** Redinbo

Lecture—3 hours. Prerequisite: course 270. Use of parallelism to achieve high performance levels. Within-CPU parallelism, through pipelining. Multiple-CPU parallelism, through array processors and multiprocessors, and through novel structures such as dataflow machines. Current research.

276A. Introduction to Fault-Tolerant Computing (3) II. Wilken

Lecture—3 hours. Prerequisite: course 171, 176. Introduces fault-tolerant computing theory and practice. Covers recent and classic fault-tolerant techniques based on hardware redundancy, time redundancy, information redundancy, and software redundancy. Examines hardware and software reliability analysis, and example fault-tolerant architectures.

276B. Introduction to Digital Fault Diagnosis (3) I. Redinbo

Lecture—3 hours. Prerequisite: course 176, Statistics 120. A review of several current techniques used to diagnose faults in both combinational and sequential circuits. Topics include path sensitization procedures, Boolean difference, D-algorithm random test generation, TC testing and an analysis of the effects of intermittent faults. Offered in alternate years.

277. Real-Time Multiprocessor/Multitasking System Design (5) III. Lin

Lecture—2 hours; laboratory—9 hours. Prerequisite: courses 172, 177, Computer Science Engineering 150. Real-time system design using multiple 16-bit microprocessors. System development and emulation through IBM/AT driven STD-bus system, and Intel's iRMX286 development system. Bus arbitration, design of basic real-time executive, and system design with iRMX289 real-time multitasking operating system. Offered in alternate years.

***278. Computer Arithmetic for Digital Implementation (3) III.** Redinbo

Lecture—3 hours. Prerequisite: course 171, 176. The design and implementation of computer arithmetic logic units are studied with particular emphasis on high-speed performance requirements. Addition

(subtraction), multiplication and division operations are covered, and fixed and floating-point representations are examined. Offered in alternate years.

***279. Artificial Neurons and Applications (4) I.** Lin
Lecture—1.5 hours; discussion—1.5 hours; laboratory—3 hours. Prerequisites: courses 172, 177, 207. Biological neuron, artificial neuron modelling and implementation, adaptive/learning algorithms, applications to pattern recognition. Offered in alternate years.

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-U. Special Topics in Electrical Engineering and Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science, (B) Programming Systems, (C) Digital Systems, (D) Communications, (E) Signal Transmission, (F) Digital Communication, (G) Control Systems, (H) Robotics, (I) Signal Processing, (J) Image Processing, (K) High-Frequency Phenomena and Devices, (L) Solid-State Devices and Physical Electronics, (M) Systems Theory, (N) Active and Passive Circuits, (O) Integrated Circuits, (P) Computer Software, (Q) Computer Engineering, (R) Microprocessing, (S) Electronics; (T) Electromagnetics; (U) Opto-Electronics. May be repeated for credit when the topic is different.

290. Seminar (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Discussion and presentation of current research and development. (S/U grading only.)

290C. Graduate Research Group Conference in Electrical and Computer Engineering (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress, and techniques in electrical and computer engineering. May be repeated for credit. (S/U grading only.)

291. Solid-State Circuit Research Laboratory Seminar (1) III. The Staff (Spencer in charge)

Seminar—1 hour. Prerequisite: graduate standing. Lectures on solid-state circuit and system design by various visiting experts in the field. (S/U grading only.)

292. Seminar in Solid-State Technology (1) III. The Staff (Churchill in charge)

Seminar—1 hour. Prerequisite: graduate standing. Lectures on solid-state technology by various visiting experts in the field. (S/U grading only.)

295A. Robotics Research Seminar (1) II. The Staff (Hsia in charge)

Seminar—1 hour. Prerequisite: graduate standing. Technical presentations and lectures on current topics of robotics research and robotics technology. (S/U grading only.)

295B. Systems and Control Seminar (1) II, III. The Staff (Gundes in charge)

Seminar—1 hour. Prerequisite: graduate standing. Seminars on current research in systems and control by faculty and visiting experts. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course**390. The Teaching of Electrical Engineering (1) I, II, III.** The Staff

Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Electrical Engineering. Participation as a teaching assistant or associate-in in a designated engineering course.

Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Engineering: Computer Science**Lower Division Courses****10. Basic Concepts of Computing (4) I, II, III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: two years of high school algebra. Introduction to principles of computing. Methods and algorithms for solving problems by use of a digital computer. Not intended for students in physical sciences, engineering, or mathematics. (Not open for credit to students who have completed course 30 or 35, Engineering 5, or former course 30H.)

15. Introduction to Computers (4) I,II,III. Walters

Lecture—3 hours; laboratory—3 hours. Computer uses in modern society. Emphasis on uses in non-scientific disciplines. Includes word processing and other applications, elementary programming concepts, and an overview of current and projected computer uses. Intended for students in majors in the College of Letters and Science, and other non-computer science majors. General Education credit: Nature and Environment/Introductory.

30. Introduction to Programming and Problem Solving (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A (may be taken concurrently). Introduction to computers and computer programming, algorithm design, running, debugging and testing of well-structured programs. Programming language Pascal will be used to solve problems. (Not open to students who have completed course 10, 35 or former course 30H. Only two units of credit allowed for students who have completed Engineering 5.)

35. Structure and Interpretation of Computer Programs*(4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Computer Science or Electrical Engineering major, Math 16A or 21A (may be taken concurrently), knowledge of Pascal or C. Mathematical foundations of computer science. Procedural and data abstraction. Design and analysis of algorithms. The Scheme programming language is used. Not open for credit to students who have completed course 10, 30, Engineering 5, or former course 30H. Intended for students who have been introduced to a high-level programming language in high school.

40. Introduction to Software Development (4) I, II, III. The Staff

Lecture—3 hours; discussion 1—hour. Prerequisite: course 30 or 35. Elements of program design, style, documentation, efficiency. Methods for debugging and verification. Application of dynamic data structures. Introduction to programming language C.

89A-L. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

92. Internship in Computer Science (1-5) I, II, III. The Staff

Internship. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work experience in computer science. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

100. Discrete Structures (3) I, II, III. 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 former Mathematics 129A.)

120. Automata Theory and Formal Languages (3) I, II. Archer, Kou, 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 former 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 former Mathematics 129B.)

140. Programming Languages (4) I, II. Archer

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 former Mathematics 129C.)

142. Compilers (4) III. Archer

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) I, II. Levitt, Matloff, Olsson

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. Study of a real operating system. Not open for credit to students who have completed Electrical and Computer Science Engineering 182A.

152. Introduction to Computer Networks (3) I. Matloff, Mukherjee

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) II, III. 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 former Mathematics 176.)

165. Database Systems (4) II. Walters

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Database hardware; input techniques; file types; database models; reliability, integrity and security; operating system interfaces with databases.

***168. Information Systems (3) I.** Walters

Lecture—3 hours. Prerequisite: course 40 or the equivalent; upper division standing. Design, creation, implementation, and case study evaluation of information systems. Project-oriented, self-paced implementation of actual information including survey collection of data, input design, and development of components to edit, sort, and retrieve data. Case study of typical information systems problems. Offered in alternate years.

170. Introduction to Artificial Intelligence (4) II. Levitt, Prieditis

Lecture—3 hours; discussion—1 hour. Prerequisite: 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 former Mathematics 174.)

172. Natural Language Processing (4) I. Alvarado

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Introduction to cognitive modeling. Study of knowledge structures and processes required for computer comprehension of human languages. Conceptual analysis based on Conceptual Dependency Theory, scripts, goals, and plans. Techniques for designing and implementing natural language parsers and generators.

175. Computer Graphics (4) I, II. Joy

Lecture—3 hours; discussion—1 hour. Prerequisite: course 110, Mathematics 22A. Principles of computer graphics. Current graphics hardware, elementary operations in two- and three-dimensional space, transformational geometry, clipping, graphics system design, standard graphics systems. Individual projects. (Not open for credit to students who have completed former course 127 or former Mathematics 173.)

189A-L. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture, laboratory or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

190C. Research Group Conferences in Computer Science (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: upper-division standing in Computer Science and Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

192. Internship in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Internship. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work experience in computer science. May be repeated for credit. (P/NP grading only.)

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

220. Theory of Computation (3) II. Linz

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. Gusfield, Martel

Lecture—3 hours. Prerequisite: course 222A. Advanced topics in complexity theory. Problem classification. The classes P, NP, P-space, co-NP. Matching and network flow algorithms. Matrix multiplication. Approximation algorithms. Selected advanced topics. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 277B.)

223. Parallel Algorithms (3) II. Martel

Lecture—3 hours. Prerequisite: course 222A. Models of parallel computer systems including PRAMs, loosely coupled systems and interconnection networks. Parallel algorithms for classical problems are studied as well as general techniques for their design and analysis. Lower bounds on parallel computation are proved in several settings.

225. Graph Theory (3) II. Hakimi

Lecture—3 hours. Prerequisite: graduate standing in electrical engineering or computer science or consent of instructor. Fundamental concepts, Vector spaces and graphs. Planar graphs: Whitney's and Kuratowski's theorems. Topological parameters: packings and coverings. Connectivity: Menger's theorem. Hamilton graphs: Posa's and Chvatal's theorems. Graph factorization: Tutte's theorem. Graph coloring: Brooks; and Vizing's theorem.

226. Computational Algorithms in VLSI (3) I. 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

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

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.

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.

247. Parallel Languages (3) I. Keller

Lecture—3 hours. Prerequisite: course 240. Language constructs for parallel computation in functional-programming, logic-programming, and related languages. Representation and implementation of task spawning and synchronization. Forms of parallelism, including explicit vs. implicit, AND vs. OR, and All-Solutions vs. Committed-Choice. Techniques of data flow, suspensions, graph reduction, backtracking, difference lists, etc. Mapping to architectures.

250A. Advanced Computer Architecture (3) I. Matloff

Lecture—3 hours. Prerequisite: course 150; Electrical and Computer Science Engineering 171. Processor complexity; the relationship between processor and memory speeds; opportunities for parallelism.

250B. High-Performance Uniprocessing (3) I. Farrens

Lecture—3 hours. Prerequisite: course 250A. Maximizing uniprocessor performance. Barriers to high performance; solutions to the problems; historical and current processor designs.

250C. Parallel Processing (3) III. Park

Lecture—3 hours. Prerequisite: course 250A. Using parallelism to increase computational speed. Interconnection topologies; parallel programming paradigms; architecture-specific algorithms; synchronization; parallel operating systems.

252. Local Area Networks (3) II. Mukherjee

Lecture—3 hours. Prerequisite: course 152. Local area networks and their functions, structures, and access protocols. Emphasis on performance modeling and analysis of multiaccess techniques in polling, ring, and random access networks. Also discussed are standards, example products, and recent directions in research.

253. Cryptography and Data Security (3) I. Levitt

Lecture—3 hours. Prerequisite: course 150; consent of instructor. Methods of protecting data in computer and communication systems from unauthorized disclosure and modification. Introduction to mathematical principles of security with applications to operating systems, database systems, and computer networks.

256A. Analytic Methods for Computer Systems Design (3) I. Matloff

Lecture—3 hours. Prerequisite: course 100, Electrical and Computer Science Engineering 171, Statistics 131A or the equivalent; Electrical and Computer Science 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 optimization. Multiple access protocols, capacity planning, topological design, flow/congestion control, routing.

260. Software Engineering (3) I.

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. Archer

Lecture—3 hours. Prerequisite: course 261. Formal specification of modules, and its relationship to top-down programming development and verification. Abstract data types, together with methods for specifying them. Implementations and proofs of implementation. Using specifications to reason about programs. Parameterized types. Constructing good formal specifications. Offered in alternate years.

265. Database Systems (3) III. Walters

Lecture—3 hours. Prerequisite: course 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) II. Alvarado

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) III. Alvarado

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 alternate 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 graphics 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-L. Special Topics In Computer Science (1-5) I, II, III. The Staff

Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing; (L) Computer Science. May be repeated for credit when the topic is different.

290. Seminar In Computer Science (1) I, II, III. The Staff

Seminar—1 hour. Participating seminar; discussion and presentation of current research and development in computer science. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Research problems, progress and techniques in computer science. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

Lecture, laboratory, or combination. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff

(S/U grading only.)

Professional 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. (S/U grading only.)

Engineering: Mechanical, Aeronautical, and Materials

(College of Engineering)

_____, Ph.D., Chairperson of the Department

Department Office, 2020 Bainer Hall (916-752-0580)

Faculty

James W. Baughn, Ph.D., Professor (*Aeronautical Science and Engineering*)

Charles W. Beadle, Ph.D., Professor Emeritus

Harry Brandt, Ph.D., Professor

John W. Brewer, Ph.D., Professor

Jean-Jacques Chatot, Ph.D., Professor

Harry A. Dwyer, Ph.D., Professor (*Aeronautical Science and Engineering*)

Fidelis O. Eke, Ph.D., Assistant Professor

Andrew A. Frank, Ph.D., Professor

Clyne F. Garland, M.S., Professor Emeritus

Warren H. Giedt, Ph.D., Professor Emeritus

Jeffery C. Gibbeling, Ph.D., Associate Professor (*Materials Science and Engineering*)

John F. Gisla, J.D., Lecturer

Joanna R. Groza, Ph.D., Associate Professor (*Materials Science and Engineering*)

Mohamed M. Hafez, Ph.D., Professor (*Aeronautical Science and Engineering*)

Jerald M. Henderson, D.Eng., Professor
(Food Science and Technology)

Ronald A. Hess, Ph.D., Professor (Aeronautical Science and Engineering)

Myron A. Hoffman, Sc.D., Professor

David G. Howitt, Ph.D., Associate Professor
(Materials Science and Engineering)

Mont Hubbard, Ph.D., Professor (Aeronautical Science and Engineering)

Maury L. Hull, Ph.D., Professor

Dean C. Karnopp, Ph.D., Professor

John D. Kemper, Ph.D., Professor Emeritus

Ian M. Kennedy, Ph.D., Associate Professor

Wolfgang Kollmann, Dr.-Ing., Professor (Aeronautical Science and Engineering)

Donald L. Margolis, Ph.D., Professor

Allan A. McKillop, Ph.D., Professor

Amiya K. Mukherjee, Ph.D., Professor (Materials Science and Engineering)

Zuhair A. Munir, Ph.D., Professor (Materials Science and Engineering)

Howard L. Needles, Ph.D., Professor (Textiles and Clothing)

Bahram Ravani, Ph.D., Associate Professor

Lawrence W. Rehfield, Ph.D. Professor (Aeronautical Science and Engineering)

Subhash H. Risbud, Ph.D., Professor (Materials Science and Engineering)

Nesrin Sarigul-Kilijn, Ph.D., Associate Professor (Aeronautical Science and Engineering)

James F. Shackelford, Ph.D., Professor (Materials Science and Engineering)

Joseph L. Steger, Ph.D., Professor (Aeronautical Science and Engineering)

Cornelis P. van Dam, Ph.D., Associate Professor (Aeronautical Science and Engineering)

Steven A. Velinsky, Ph.D., Associate Professor

Bruce R. White, Ph.D., Professor (Aeronautical Science and Engineering)

Kazuo Yamazaki, Ph.D., Professor

An Tzu Yang, D.E.Sc., Professor Emeritus

S. Haig Zeronian, Ph.D., D.Sc., Professor (Textiles and Clothing)

Division of Aeronautical Science and Engineering

Faculty

James W. Baughn, Ph.D., Professor

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James A. Cheney, Ph.D., Professor (Civil Engineering)

Jean-Jacques Chattot, Ph.D., Professor

Harry A. Dwyer, Ph.D., Professor (Mechanical Engineering)

Mohamed M. Hafez, Ph.D., Professor

Leonard R. Herrmann, Ph.D., Professor (Civil Engineering)

Ronald A. Hess, Ph.D., Professor (Mechanical Engineering)

Myron A. Hoffman, Sc.D., Professor (Mechanical Engineering)

Mont Hubbard, Ph.D., Professor (Mechanical Engineering)

James R. Hutchinson, Ph.D., Professor (Civil Engineering)

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Division of Materials Science and Engineering

Faculty

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Zuhair A. Munir, Ph.D., Professor

Howard L. Needles, Ph.D., Professor (Textiles and Clothing)

Subhash H. Risbud, Ph.D., Professor

James F. Shackelford, Ph.D., Professor

S. Haig Zeronian, Ph.D., D.Sc., Professor (Textiles and Clothing)

Courses in Engineering: 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 (Chairperson in charge)
Lecture—1 hour. Description of the field of mechanical engineering with examples taken from industrial applications; discussion of the practice with respect to engineering principles, ethics and responsibilities. (P/NP grading only.)

92. Internship in Mechanical Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Internship. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work experience in engineering. May be repeated for credit (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

134. Vehicle Stability (4) III. Hubbard
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 (3) I, III. Frank, Velinsky
Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 104B, course 150L (may be taken concurrently). Restricted to Aeronautical and Mechanical Engineering and Materials Science majors. The principles of engineering mechanics applied to fundamentals of mechanical design. Theories of static and fatigue failure of metals. Design projects emphasizing the progression from conceptualization to hardware.

150B. Mechanical Design (4) I, II. Frank
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Restricted to Aeronautical and Mechanical Engineering and Materials Science majors. Principles of engineering mechanics, failure theories and fatigue theory applied to design and selection of mechanical components. Design projects which concentrate on design, engineering analysis, methods of manufacture, material selection and cost. Introduction to computer-aided design.

150L. Manufacturing Processes (2) I, II, III. Henderson
Discussion—1 hour; laboratory—3 hours. Restricted to junior and senior Mechanical, Aeronautical, and Materials Science Engineering majors. Introduction to and experience with modern manufacturing methods and computer-aided manufacturing and their role in engineering design and development process.

151. Statistical Methods in Design (3) II. Frank
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. Ravani
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.

161. Combustion and the Environment (4) III. Kennedy
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Introduction to combustion kinetics; the theory of premixed flames and diffusion flames; turbulent combustion; formation of air pollutants in combustion systems; examples of combustion devices which include internal combustion engines, gas turbines, furnaces and waste incinerators; alternative fuel sources.

162. Modern Power Systems (4) II. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Study of modern powerplants for electric power generation and cogeneration. Thermodynamic analysis of different powerplant concepts using fossil fuels, nuclear fuels, solar energy, etc. Design studies of some specific powerplants.

165. Fundamentals of Heat Transfer (4) I, II. McKillop, Dwyer
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 5, 103B and 105B; restricted to Aeronautical and Mechanical Engineering and Materials Science majors. Fundamentals of conduction, convection and radiation heat transfer; applications to engineering equipment with use of digital computers.

171. Analysis, Simulation, and Design of Dynamic Systems (4) I. Karnopp, Margolis
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A, Engineering 102B and 180; restricted to Aeronautical and Mechanical Engineering and Materials Science majors. 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.

176. Measurement Systems (3) II, III. Velinsky
Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: Engineering 100 and 102A; restricted to Aeronautical and Mechanical Engineering and Materials Science students. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization.

184A. Mechanical Engineering Design Project (2) I, II, III. The Staff
Laboratory—6 hours. Prerequisite: senior standing in Mechanical Engineering; consent of instructor. 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. Henderson
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of mechanical systems. Engineering case studies will help to illustrate the engineering design process and its use in design of engineering systems. Grading based on individual contributions to projects.

186. Thermal Systems Design Project (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165; senior standing in Mechanical Engineering or Physics (enrollment preference to students who have not taken any of course series, 184-188). Design of a thermal system such as a power plant or engine, including consideration of engineering and

economic factors. Grading based on individual contributions to project. Limited enrollment.

187. Control Systems Design Project (4) III. Frank Lecture—3 hours; discussion—1 hour. Prerequisite: course 172; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of dynamic engineering systems. Formulation of goals, mathematical modeling of plant, consideration of passive, open loop, and closed loop active solutions. Hardware and cost/performance considerations. Grading based on individual contributions to projects.

188. Vehicle Systems Design Project (4) II. Frank Lecture—2 hours; laboratory—6 hours. Prerequisite: course 150B; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of vehicle systems, including components, and/or complete vehicles for groups or individuals. Students will design, analyze, construct and evaluate a vehicle-related component. Grading based on individual contributions to projects. Limited enrollment.

192. Internship In Engineering (1-5) I, II, III. The Staff (Chairperson in charge) Internship. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in mechanical engineering. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

205. Thermal Radiation (3) II. Brandt Lecture—3 hours. Prerequisite: course 165 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Applications to solar energy systems.

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 Engineering 103B. Application of shadow, schlieren and other flow visualization methods. Introduction to optics and lasers. Measurement of velocity and concentrations in reacting and non-reacting flows with laser diagnostic techniques including LDV, Rayleigh, Raman and fluorescence scattering and CARS. Offered in alternate years.

208C. Experimental Methods in Fluid Mechanics and Hot-Wire Anemometry (3) III. White Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: Engineering 103B. Measurements in fluid mechanics using experimental techniques to determine flow direction, wall shear stress, turbulence quantities, etc. Introduction to hot-wire anemometry and its application to the measurement of turbulent flows. Introduction to data acquisition of fluid mechanics measurements. Offered in alternate years.

210A. Advanced Fluid Mechanics and Heat Transfer (4) I. Dwyer Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, course 165. Development of differential equations governing continuity, momentum, and energy transfer. Solutions in laminar flow for exact cases, low and high Reynolds numbers and lubrication theory. Dynamics of inviscid flow.

210B. Advanced Fluid Mechanics and Heat Transfer (4) II. Kollmann Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A. Study of stability and transition to tur-

bulence. Introduction to the physics of turbulence. Modeling of turbulence for numerical determination of momentum and heat transfer.

211. Fluid Flow and Heat Transfer Design (4) I. Hoffman Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A (may be taken concurrently) or consent of instructor. Design aspects of selected topics such as heat conduction, thermal stresses, fins; heat transport in ducts, boundary layers and separated flows; impingement and film cooling; heat exchangers; flow in diffusers, flow over airfoils and blades. Offered in alternate years.

212. Advanced Heat Transfer with Phase Change (4) III. Hoffman Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Study of complex phenomena occurring in two-phase flow, boiling and condensation. Development of fundamental relations. Use of these relations with experimental data to develop semi-empirical working relations; application to various energy system and power-plant problems. Offered in alternate years.

213. Advanced Turbulence Modeling (4) III. Kollmann Lecture—4 hours. Prerequisite: course 210B. Methods of analyzing turbulence; kinematics and dynamics of homogeneous turbulence; Reynolds stress and heat-flux equations; second order closures and their simplification; numerical methods; application to boundary layer-type flows; two-dimensional and three-dimensional hydraulic and environmental flows. Offered in alternate years.

214. Numerical Calculation of Flows with Heat Transfer, Mass Transfer, and Chemical Reactions (4) II. Dwyer Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A and Aeronautical Science Engineering 233, or consent of instructor. Application of numerical approximation methods of fluid flows involving heat and mass transfer for mechanical and aeronautical applications. Applications to pipe flows; high Peclet number heat transfer; laminar and turbulent combustion; and solution of the Navier-Stokes equations. Offered in alternate years.

216. Advanced Thermodynamics (4) I. The Staff 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 non-reacting and chemically reacting gases, gas mixtures, and other substances. Offered in alternate years.

217. Combustion (4) II. Kennedy Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Review of chemical thermodynamics and chemical kinetics. Discussions of reacting flows, their governing equations and transport phenomena; detonations; laminar flame structure and turbulent combustion.

218. Advanced Energy Systems (4) I. Hoffman Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, or the equivalent. Review of options available for advanced power generation. Detailed study of basic power balances, component efficiencies, and overall powerplant performance for one advanced concept such as a fusion, magnetohydrodynamic, or solar electric powerplant. Offered in alternate years.

220A-220B. Mechanical Vibrations (3-3) II-III. Eke 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. Margolis Lecture—3 hours. Prerequisite: Engineering 102B. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory.

224. Kinematic Design of Mechanisms (3) II. The Staff Lecture—3 hours. Prerequisite: course 152 or con-

sent of instructor. Introduction to Bernoulli theory of the rational design of link mechanisms. Geometric concept of two- and three-dimensional rigid-body displacements, instantaneous invariants, higher order path curvature analysis, circle- and center-point curves. Graphic and computer methods for kinematic design. Offered in alternate years.

225. Spatial Kinematics and Robotics (3) II. The Staff 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 alternate 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 alternate years.

255. Computer-Aided Design and Manufacturing (3) III. Ravan Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 180 and course 150B. Proficiency in a high-level programming language such as FORTRAN, Pascal, or C. Studies of computational and computer graphic techniques in design and manufacturing. Use of numeric and non-numeric computations and geometric tools in design and manufacturing.

270. Modeling and Simulation of Engineering Systems (3) I. Karnopp Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation, approximate models of distributed systems.

271. Design of Multivariable Control Systems (3) II. Karnopp Lecture—3 hours. Prerequisite: course 270 or consent of instructor. Modern methods of state variable feedback applied to control system design. Introduction to observers and equivalent dynamic feedback. Stress on practical application of theory to engineering systems in various energy domains.

272A. Mathematical Foundations of System and Control Theory (4) I. Brewer Lecture—4 hours. Prerequisite: course 172. Singularity functions, Laplace transforms, and Z-transforms. Algebra of groups and rings and of polynomials and matrices. Reducibility, controllability, and observability. Observers and feedback control for single input, single output systems. Equal emphasis on frequency domain and state variable methods.

272B. Multivariable Feedback Control and Estimation Theory (4) II. Brewer Lecture—4 hours. Prerequisite: course 272A. Emphasis on multi-input, multi-output systems. Digital and continuous time control and estimation. Introduction to singular value methods and quantitative feedback theory. Optimum Wiener-Hopf design and other frequency domain methods.

272C. Mathematical Foundations of Nonlinear Control Theory (4) III. Brewer Lecture—4 hours. Prerequisite: course 272B. Emphasis on the mathematical analysis of feedback systems which contain a non-linear element. Poincare-Bendixson theory and limit cycles. Harmonic balance and describing functions. Chaos and strange attractors. Lie algebras and linearization.

274. Analysis and Design of Digital Control Systems (4) III. Hess Lecture—3 hours; discussion—1 hour. Prerequisite: course 172. Discrete systems analysis; digital filter-

ing; sample data systems; state space and transform design techniques; quantization effects.

276A. Digital Data Acquisition and Analysis (3) I. Gibeling

Lecture—2 hours; discussion—1 hour. Prerequisite: course 176. Application of microcomputers and mini-computers to data acquisition and control. Topics include computer organization, hardware for laboratory applications of computers, fundamentals of interfaces between computers and experimental equipment, programming techniques for data acquisition and control, and basic data analysis.

276B. Digital Data Acquisition and Analysis (3) II. Hull

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 5, 118, and 180; course 176. 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 of 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.

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress, and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

295. Design Seminar (1) I, II, 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, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of the current literature and trends in fluid mechanics and thermal sciences. (S/U grading only.)

297. Dynamic Systems and Control Theory Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in system theory and automatic control with presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390. The Teaching of Mechanical Engineering (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in 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. Sarigul-Klijn

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. van Dam

Lecture—3 hours; discussion—1 hour. Prerequisite: course 127. Aircraft propulsion systems and their performance characteristics. Methods for computing and presenting aircraft performance data. Modern techniques of numerical analysis and energy methods. Application of techniques to aircraft design.

129. Aircraft Stability and Control (4) II. Hess

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 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. The Staff

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, Sarigul-Klijn

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 125 and 128. Measurements and analysis of aircraft characteristics and performance, in flight and with flight simulator.

135. Aerospace Structures (3) II. Sarigul-Klijn

Lecture—3 hours. Prerequisite: Engineering 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) I. Rehfield

Lecture—3 hours; laboratory—1 hour. Prerequisite: Engineering 104B. Overview of materials and technology for creating structures from fiber reinforced resin matrix composite material systems. Elementary design analysis and case studies emphasizing aeronautical applications.

138A. Aircraft Propulsion (4) II. Hoffman

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 45, 103B, 105B. Analysis and design of modern aircraft gas turbine engines. Development and application of cycle performance prediction techniques for important engine configurations. Intro-

duction to the operation and design of inlets, compressors, burners, turbines, and nozzles. Cycle design studies for specific applications.

139. Introduction to Aeroelasticity (4) III. Sarigul-Klijn, Rehfield

Lecture—4 hours. Prerequisite: course 127, 135. Fundamentals of structural dynamics and an introduction to aeroelasticity. Categorization of aeroelastic problems; aeroelastic operators. Static aeroelastic and flutter instabilities of simple structures. Offered in alternate years.

161. Gas Dynamics (4) III. Steger

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B. Development of the governing equations, analysis of one-dimensional steady and unsteady compressible flow, shock waves, and heat addition, special forms of the governing equations, steady supersonic flow, small disturbance theory, numerical demonstration of steady and unsteady flow effects.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

230. Advanced Aerodynamics-Inviscid Flow (4) II. Hafez

Lecture—4 hours. Prerequisite: courses 126, 127. Inviscid theory. Nonlinear effects in subsonic and supersonic flows. Transonic aerodynamics. Offered in alternate years.

232. Advanced Aerodynamics-Viscous Flow (4) I. 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 alternate years.

233. Introduction to Computational Aerodynamics and Fluid Dynamics (4) I. Chattot, Hafez, Steger, Dwyer

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B. Introduction to numerical methods of solution of fluid flow problems. Discretization techniques and solution algorithms. Finite difference solutions to classical model equations pertinent to wave phenomena, diffusion phenomena, or equilibrium. Application to the incompressible Navier-Stokes equation.

234. Computational Aerodynamics (4) II. Hafez

Lecture—4 hours. Prerequisite: courses 230, 233. Numerical methods for aerodynamics flow simulation in the transonic regime. Solutions of steady and unsteady potential and compressible boundary layer equations. Numerical schemes for mixed type equations and shock waves/numerical grid generation. Viscous/inviscid interaction and coupling procedures.

235. Computational Fluid Dynamics, Euler and Navier-Stokes Equations (4) III. Steger

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 233 or consent of instructor. Euler and Navier-Stokes equations, conservative form, numerical methods for systems of convection and convection-diffusion equations, computation of compressible Euler and Navier-Stokes equations, generalized coordinates, grid generation, applications.

236. Aerodynamics In Nature and Technology (4) 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 alternate years.

237. Analysis and Design of Composite Structures (4) III. Rehfield

Lecture—3 hours; discussion—1 hour. Prerequisite: course 137. Modeling and analysis methodology for composite structures including response and failure. Laminated plate bending theory. Introduction to failure processes.

238. Advanced Aerodynamic Design and Optimization (4) III. van Dam

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Application of aerodynamic theory to obtain optimum aerodynamic shapes. Both analytic solutions and solutions obtained with numerical optimization techniques will be examined. Includes introduction to the calculus of variations and numerical optimization techniques. Offered in alternate years.

***275. Advanced Topics in Aircraft Stability and Control (3) I.** 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; auto pilot and stability augmentation system design; pilot/vehicle analysis; handling qualities.

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(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 Aeronautical Science and Engineering. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Materials Science and Engineering**Upper Division Courses****130. Thermodynamics of Materials Processes (3) I.** Risbud

Lecture—3 hours. Prerequisite: Engineering 45 and 105A (or the equivalent); upper division standing in Engineering. Application of the principles of thermodynamics to solid engineering materials with emphasis on solving problems associated with materials processes, e.g., alloying, phase stability, surface properties, semiconductor, thermoelectric power and thermionic energy conversion.

132. Structure of Engineering Materials (3) I. Shackelford

Lecture—3 hours. Prerequisite: Engineering 45; upper division standing. Structure of engineering materials on the atomic scale will be described by exploring the fundamentals of crystallography. The importance of this structure to materials' properties will be emphasized. Experimental determination of structure will be described using x-ray diffraction techniques.

132L. Structure of Materials Laboratory (1) I. Shackelford

Laboratory—3 hours. Prerequisite: course 132 concurrently. Experimental investigations of the structure of solid materials. Laboratory exercises emphasize methods used to study structure of solids at atomic and microstructural levels.

134. Rate Processes in Materials Science (3) III. Groza

Lecture—3 hours. Prerequisite: Engineering 45 and 105A or course 130. Basic kinetic laws. Theory of Absolute Reaction Rates. Applications in diffusion, nucleation, solidification, evaporation, and sintering processes.

134L. Rate Processes in Materials Laboratory (1) III. Groza

Laboratory—3 hours. Prerequisite: course 134 concurrently. Laboratory experiments to illustrate fundamental principles of diffusion, solidification, recrystallization, precipitation, evaporation, sintering and phase transformations in materials.

138. Mechanical Behavior of Materials (3) II. Mukherjee

Lecture—3 hours. Prerequisite: Engineering 45 and 105A (or the equivalent); upper division standing in Engineering. Microscopic aspects of the mechanical behavior of engineering materials are discussed with emphasis on recent developments in materials science and fracture mechanics. High temperature plastic deformation processes, strengthening mechanisms and mechanical failure modes of materials systems are outlined.

138L. Mechanical Properties Laboratory (1) 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. Groza
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. Howitt

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. Howitt
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. The Staff

Lecture—3 hours. Prerequisite: chemistry through organic or Engineering 45; introductory physics sequence. Basic principles of polymer science presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Fiber and Polymer Science 100.)

148. Failure Analysis (4) III. Gibeling

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 45, 104A; course 138 and Mechanical Engineering 150A recommended. Fracture mechanics and failure mechanisms in metals, ceramics, and composites. Effects of fatigue, corrosion and wear. Methodology for investigating failure including optical microscopy, scanning electron microscopy and destructive testing.

149. Materials Engineering Design Project (3) I, II, III. The Staff

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 140 may be taken concurrently. A capstone engineering design experience involving analysis of real materials processes or engineering materials problems. The various principles of materials science introduced in other courses in the curriculum are integrated into the design project.

198. Directed Group Study (1-5) I, II, III. The Staff

Lecture—1-5 hours. Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. P/NP grading only.

Graduate Courses**230. Fundamentals of Electron Microscopy (3) II.** Howitt

Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 132. Principles and techniques of scanning and transmission of electron microscopy used in the study of materials. Emphasis upon practical applications. Offered in alternate years.

230L. Laboratory for Electron Microscopy (2) II. Howitt

Laboratory—6 hours. Prerequisite: course 230 concurrently. Practical application of techniques of electron scanning and transmission microscopy including x-ray microanalysis. Offered in alternate years.

232. Advanced Topics in Transmission Electron Microscopy (3) II. Howitt

Lecture—1 hour; discussion—2 hours. Prerequisite: course 230. Advanced course in the techniques of electron microscopy including analytical techniques, probe diffraction methods, and high resolution imaging. Offered in alternate years.

232L. Laboratory for Advanced Transmission Electron Microscopy (2) II. Howitt

Discussion—1 hour; laboratory—3 hours. Prerequisite: course 232 concurrently. Laboratory in advanced transmission electron microscopy techniques relevant to specific graduate research projects in materials science. Offered in alternate years.

240. Transport Phenomena in Materials Processes (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering. Phenomenological and atomistic mechanisms in transport processes in condensed and noncondensed phases. Application to heat treatment, chemical and physical vapor deposition, crystal growth, bonding, sintering and joining of metals. Offered in alternate years.

241. Principles and Applications of Dislocation Mechanics (4) II. Mukherjee

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering; consent of instructor. Concepts in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in alternate years.

242. Advanced Mechanical Properties of Materials (4) III. Mukherjee

Lecture—3 hours; discussion—1 hour. Prerequisite: course 138. Strength and structure of engineering materials. The dependence of their mechanical properties on time, stress, and temperature. Generalized concepts of dislocation theory in plastic deformation, including creep, superplasticity, and cavitation. Influence of microstructure in optimizing the mechanical strength properties. Offered in alternate years.

243. Kinetics of Phase Transformation in Engineering Materials (3) II. Groza

Lecture—3 hours. Prerequisite: graduate standing in Engineering and consent of instructor; course 130 recommended. Theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions. Offered in alternate years.

244. Interaction of Materials and their Environment (3) I. Munir

Lecture—3 hours. Prerequisite: Engineering 45 and 105A, or consent of instructor. Thermodynamic and kinetic foundations of the corrosion and oxidation processes. Practical aspects of corrosion control and prevention. Stress-corrosion and gas-embrittlement phenomena. Special topics in corrosion; microbiological and atmospheric corrosion. Offered in alternate years.

245. Advanced Topics in Structure of Materials (4) III. Shackelford

Lecture—3 hours; discussion—1 hour. Prerequisite: course 132 and graduate standing in Engineering or consent of instructor; courses 138 and 142 recommended. Nature of microstructure in engineering materials will be explored. Crystalline and non-crystalline structures will be studied with special emphasis on grain boundary segregation in development of polycrystalline microstructure and the radial distribution function of amorphous materials. Offered in alternate years.

247. Advanced Thermodynamics of Solids (3) I. Munir

Lecture—3 hours. Prerequisite: course 130 or the equivalent. Thermodynamics of gas-solid reactions and solutions; criteria for phase stability, thermodynamics of surfaces and Interfaces; thermodynamics of defects in compounds, their influence on transport processes; thermodynamics of EMF cells and application to solid-state electrolytes. Offered in alternate years.

248. Fracture of Engineering Materials (3) I. Gibeling

Lecture—3 hours. Prerequisite: course 138. Description of failure of materials by crack propagation. Topics include the stress fields about elastic cracks, the Griffith-Irwin analysis, descriptions of plastic zones, fracture toughness testing, microstructural aspects of fracture and failure at elevated temperatures. Offered in alternate years.

249. Mechanisms of Fatigue (3) I. Gibeling

Lecture—3 hours. Prerequisite: course 138 or consent of instructor; course 248 recommended. Microstructural description of mechanisms of fatigue in metals. Topics include a phenomenological treatment of cyclic deformation, dislocation processes in cyclic deformation, fatigue crack nucleation, stage I crack growth, threshold effects and high temperature cyclic deformation. Offered in alternate years.

250A-F. Special Topics in Polymer and Fiber Science (3) II. Zeronian

Lecture—3 hours. Prerequisite: course 147 or consent of instructor. Selected topics of current interest in polymer and fiber sciences. Topics will vary each time the course is offered. (Same course as Textiles and Clothing 250A-F.)

290C. Graduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress, and techniques in materials science and engineering research. May be repeated for credit. (S/U grading only.)

294. Materials Science Seminar (1) I, II, III. Shackelford, Mukherjee, Munir, Howitt, Gibeling, Groza, Risbud

Seminar—1 hour. Prerequisite: graduate student in good standing. Review and discussion of current literature and developments in materials science with presentations by individual students. (S/U grading only.)

298. Introduction to the Surface Science of Solids (3) II. Farness

Lecture—3 hours. Prerequisite: courses 130 and 132, or the equivalent. Thermodynamics of surfaces, terrace-ledge-kink model. Surface diffraction methods: LEED, READ, and TEM. Electron emission from surfaces; Auger, FIM, SEM, and scanning tunneling microscopy. Chemical analysis using ESCA, AES, RBS, and PIXE. Applications to thin films and coatings. Offered in alternate years.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Professional Course**390. The Teaching of Materials Science (1) I, II, III.** The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in mechanical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

English

(College of Letters and Science)

_____, Ph.D., Chairperson of the Department

Department Office, TMP Bldg. 195 #4
(916-752-2257)

Faculty

William E. Baker, Ph.D., Professor
Max Byrd, Ph.D., Professor
Everett Carter, Ph.D., Professor Emeritus
Peter A. Dale, Ph.D., Professor
Sandra M. 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
Peter L. Hays, Ph.D., Professor
W. Jack Hicks, Ph.D., Associate Professor
Michael J. Hoffman, Ph.D., Professor
Robert H. Hopkins, Ph.D., Professor Emeritus
Michael P. Kramer, Ph.D., Associate Professor
Richard A. Levin, Ph.D., Associate Professor
Karl E. Lokke, Ph.D., Assistant Professor
Clarence Major, Ph.D., Professor
Arthur E. McGuinness, Ph.D., Professor
Sandra J. McPherson, B.A., Professor
Patricia L. Moran, Ph.D., Assistant Professor
Linda A. Morris, Ph.D., Senior Lecturer
James J. Murphy, Ph.D., Professor Emeritus
Marjane Osborn, Ph.D., Associate Professor
David A. Robertson, Ph.D., Associate Professor
Winfried Schleiner, Ph.D., Professor
Gwendolyn Schwabe, M.A., Senior Lecturer Emeritus
Karl J. Shapiro, Professor Emeritus
Daniel Silvia, Ph.D., Associate Professor Emeritus
Gary Snyder, B.A., Professor
Margit K. Stange, Ph.D., Assistant Professor
Elizabeth Tallent, B.A., Associate Professor
David Van Leer, Ph.D., Associate Professor
Raymond B. Waddington, Ph.D., Professor
Brom Weber, Ph.D., Professor of American Literature
Emeritus
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., Professor

The Major Program

The study of English develops skills in reading analytically and perceptively and in writing clearly and with effect.

The Program. The English department offers three kinds of courses: composition courses, undergraduate courses, and graduate courses. Composition courses develop skills in reading analytically and in writing persuasively. Undergraduate and graduate courses cover the entire range of English and American literature, as well as creative writing. Students majoring in English may elect a *teaching* emphasis, a *creative writing* emphasis, or a *general literature* emphasis. The teaching emphasis focuses on the study of composition and of language. The writing emphasis focuses on fiction, poetry, article writing, and magazine editing. Creative writing majors have an opportunity to work with distinguished professional writers of fiction and poetry, and to be involved with a national literary magazine, *California Quarterly*, published by the English department. The general literature emphasis focuses on a series of related courses in various historical periods of English and American literature. A Senior Honors Program is available to an invited group of English majors, who prepare and write a Senior Thesis (either a research paper or creative writing) in their final year. Graduate courses lead to the M.A. and Ph.D. degrees.

Career Alternatives. Graduates have found the major excellent pre-professional training for graduate study in English, as well as for careers in teaching, law, medicine, and library work. Many graduates are employed in journalism, publishing, advertising, and public information. Others have worked in local, state, and federal government agencies, as well as in industry and agriculture. Some have even established their own businesses.

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter	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 each in four of the following five areas	
1) British literature, beginnings to 1500: English 111, 150A	
2) British literature, 1500-1660: English 116, 120, 150B	
3) British literature, 1660-1800 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, 185A	
5) Twentieth-century British or American literature: English 136, 137, 138, 139, 146, 147, 150D, 152, 155D, 158B, 160, 179, 181, 185B	
B. <i>Major Authors</i>	8
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, 194H.	
The following courses—English 110A, 110B, 156, 160, 162, 171A, 171B, 173, 175, 177, 178, 179, 180, 181, 182, 184, 185A, 185B, 187, 188, 189, 198, and 199—are designed for studying a special subject, one that may be fairly con-	

stant in format (as with English 110A, 110B, 156, 160, 162, 171A, 171B, 173, 175, 178, 179, 180, 181, 185A, 185B) or one that may vary each time the course is offered (as with English 177, 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: English 105A, 105B,	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-F, 105A, 105B.....	12
One course selected from English 179, 181, or an ethnic literature course from out- side 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 language and linguistics: English 105A, 105B.....	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 916-752-8024, 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.

Undergraduate Adviser: A.E. McGuinness

Major Advisers. W.E. Baker, M. Byrd, P.A. Dale, S.M. Gilbert, J.O. Hayden, P.L. Hays, W.J. Hicks, M.P. Kramer, R.A. Levin, K.E. Lokke, C. Major, A.E. McGuinness, S.J. McPherson, P.L. Moran, L.A. Morris, M. Osborn, W. Schleiner, M.K. Stange, E. Tallent, D. Van Leer, R.B. Waddington, A.B. Williamson, K.F. Zender.

Foreign Languages. Students who contemplate advanced study in English should prepare for foreign language requirements for higher degrees, and should consult with the graduate adviser.

Honors and Honors Program. The honors program consists of four units of 194H and four units of 195H, normally taken during the fall and winter quarters of the senior year. Completion of the program is a prerequisite for High or Highest Honors at graduation. Eligibility criteria and application materials may be obtained at the Undergraduate Office, 111/113 Sproul Hall. Refer to the Academic Information section and the College section for Dean's Honors List information.

Teaching Credential Subject Representative. R.A. Levin. See also under Teacher Education Program.

Graduate Study. The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the graduate adviser or the Chairperson of the Department.

Graduate Adviser. D.A. Robertson.

Courses in English

Lower Division Courses

A. Language Skills (2) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Introductory course to help students gain writing proficiency required for successful University-level work. Focus on critical thinking, reading, and writing; on the fundamentals of essay writing; and on the relationship between writing mechanics and coherent thought. This course must be taken for a letter grade. Minimum passing grade is a C; students receiving a C- or below must repeat course. Satisfies Subject A requirement. (Counts as 4 units toward minimum program.)

R. Communications Skills Workshop (0) I, II, III.

The Staff (Chairperson in charge)
Lecture—4 hours; workshop—2 hours; reading laboratory—1 hour. Workshop in language skills for students from non-standard-English backgrounds who need to strengthen basic skills before taking English A. Course worth 6 units toward minimum study list requirement. (P/NP grading only.)

1. Expository Writing (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. Composition, the essay, paragraph structure, diction, and related topics. Frequent writing assignments will be made. (CAN Engl 2)

3. Introduction to Literature (4) I, II, III. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. Introductory study of several genres of English literature, emphasizing both analysis of particular works and the range of forms and styles in English prose and poetry. Frequent writing assignments will be made. General Education credit: Civilization and Culture/Introductory.

4. Critical Inquiry and Literature: Freshman Seminar (4) I. The Staff (Chairperson in charge)

Seminar—4 hours. Prerequisite: completion of Subject A requirement and consent of instructor; enrollment limited to freshmen. Critical inquiry into significant literary texts. Emphasis on close reading, classroom dialogue, and the writing of several papers or a

longer seminar paper. General Education credit: Civilization and Culture/Introductory.

5F. Introduction to Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge).

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing fiction. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

5P. Introduction to Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing poetry. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

20. Intermediate Composition (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Prerequisite: course 1 or 3. Emphasis on the grammatical patterns of standard English, sentence revision techniques, development of coherent paragraphs, and the formal properties of the expository essay.

21. Introduction to Reading and Composition in ESL (5) I, II. The Staff (Chairperson 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 (Chairperson 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 (Chairperson 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. —

Lecture—3 hours; laboratory—4 hours. 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.

26. English for Foreign Students (5) II, III. —

Lecture—3 hours; laboratory—4 hours. 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) 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. 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 preparation: any course from the GE Literature Preparation List. (CAN Engl 14)

30B. Survey of American Literature (4) I. Hays; III. Barrish

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 preparation: any course from the GE Literature Preparation List. (CAN Engl 16)

45. Close Reading of Poetry (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—4 hours. Prerequisite: course 1 or 3. Close reading of selections from English and American poetry. Frequent written exercises.

46A. Masterpieces of English Literature (4) I. Schleiner; II. Hayden

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 preparation: any course from the GE Literature Preparation List. (CAN Engl Seq B)

46B. Masterpieces of English Literature (4) II. Byrd; III. ———

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 preparation: any course from the GE Literature Preparation List. (CAN Engl Seq B)

46C. Masterpieces of English Literature (4) I. ———; II. Moran

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers from 1832 to present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List. (CAN Engl Seq B)

92. Internship in English (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: course 1 or 3. Internships in fields where students can practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: one course from 1 or 3. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

100F. Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge)

Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of fiction. May be repeated for credit with consent of instructor. No final examination.

100NF. Creative Writing: Non-Fiction (4) I, II. Hicks

Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 1 or 3, or consent of instructor; priority given to English (Creative Writing) majors. Writing of non-fiction. May be repeated for credit with consent of instructor. No final examination.

100P. Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge)

Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing)

majors. Writing of poetry. May be repeated for credit with consent of instructor. No final examination.

102. Adjunct Writing (3) I, II, III. The Staff (Chairperson in charge)

Discussion—3 hours. Prerequisite: course 1 or 3; concurrent enrollment in a specified course in a subject-matter discipline. Instruction in the elements of expository writing, with special emphasis on their application to writing projects in a specified academic discipline. May be repeated once for credit if taken in conjunction with a different subject-matter course.

103A-F. Advanced Composition (4) I, II, III. The Staff (Chairperson in charge)

Lecture/discussion—3 hours; individual evaluations and conferences. Prerequisite: course 1 or 3; course 20 recommended. Instruction and practice in a variety of modes of composition. Frequent written assignments. One area required of teaching credential candidates (section "F" strongly recommended). Study areas are: (A) General; (B) Legal Writing; (C) Article Writing; (D) Report Writing; (E) Technical Writing; (F) Composition for Elementary and Secondary Teachers. May be repeated once for credit in different area of emphasis.

104. Scientific Writing (1-3) I, II, III. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour. Prerequisite: upper division enrollment in a science curriculum. Analysis and practice of scientific writing; research methods, organization, proper style and format, oral presentation of scientific papers. Lecture and workshop-discussions by English and science department staff. May be repeated for a total of 4 units of credit. (P/NP grading only.)

105A. Language (4) II, III. ———

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.

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) III. McGuinness

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. Cioffi

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 literature. Mostly in translation.

113A. Chaucer: *Troilus* and the "Minor" Poems (4) I. Osborn; III. Cioffi

Lecture—3 hours; term paper. Prerequisite: course 1 or 3. Development of the poet's artistry and the evolution of the poet's ideas from his first work to his culminating masterpiece, *Troilus and Criseyde*. Courses 113A and 113B need not be taken in sequence.

113B. Chaucer: *The Canterbury Tales* (4) II. Osborn

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) II. Waddington

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) II. Waddington; III. Levin

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works from Shakespeare's middle period, up to 1604. Courses 117A-117B-117C need not be taken in sequence.

117C. Shakespeare: The Later Works (4) I. Zender; III. ———

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Selected major works from Shakespeare's later period. Courses 117A-117B-117C need not be taken in sequence.

***118. Shakespeare (4) I.**

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-Introductory. Recommended GE preparation: any course from the GE Literature Preparation 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) III. Schleiner

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)**

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) I. Byrd

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. Recommended GE preparation: any course from the GE Literature Preparation 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 Romantic concepts of imagination.

132. Later Romantic Literature (4) III. Lokke

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Byron, Shelley, Keats. Individualism and revolt.

***133. Early Victorian Literature (4)**

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) I. ———; II.

Lecture/discussion—3 hours; term paper. Prerequisite:

site: course 1 or 3. Ruskin, Hardy, Hopkins, and others. The Oxford movement, the Pre-Raphaelites; art and sociology; aestheticism and decadence; pessimism. Tendencies continuing into the Edwardian period.

***136. British Literature from 1880 to 1918 (4)**
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Yeats, Conrad, Joyce. Aestheticism, naturalism, symbolism, and impressionism. Transition from Victorian to twentieth-century styles and attitudes.

137. British Literature from 1918 to 1940 (4) II. Williamson
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) III. Moran
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) III. 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) II. Barrish
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Eighteenth-century American literature; rise of neoclassicism, liberal religion, popular literature, scientific thought, satiric tempers; decline of Puritan traditions; major writers, including Franklin, Edwards, Freneau, and Brackenridge.

143. Aspects of American Romanticism (4) II. Van Leer
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 Hawthorne and Melville; Emily Dickinson.

144. American Literature from 1865 to 1914 (4) III. Barrish
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, Howells.

146. Modern American Literature: 1914-1940 (4) I. Hoffman
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) I. Levin
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 tragicomedy; post-Shakespearean development of dramatic action and blank verse.

***150D. British Drama from 1890 to the Present (4) III.** McGuinness
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) III.
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) I. 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), invention of the historical novel (Sir Walter Scott), and contribution of women writers to fiction (Jane Austen, Emily, Charlotte, and Anne Bronte).

155C. The English Novel: 1850-1900 (4) 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. Baker
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) II. Moran; III. Zender
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. The short story as a genre; its historical development, techniques, and formal character as a literary form. European as well as American writers. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

158A. The American Novel to 1900 (4) I. ———
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) III. Hays
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Major American novelists of the twentieth century. Faulkner, Hemingway, Fitzgerald, and others.

160. Film As Narrative (4) I. ———
Discussion—2 hours; lecture and film study—3 hours. Prerequisite: course 1 or 3. Study of modern film (1930 to the present) as a storytelling medium.

162. Film Theory and Criticism (4) III. ———
Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 1 or 3. Film theory and criticism, with a study of ten major works of international film art. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

171A. The Bible as Literature: The Old Testament (4) I. Robertson
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. May be taken independently of course 171B. Selected readings from the Old Testament illustrating various literary forms. Emphasis on

the Pentateuch, the Historical Books, and the Wisdom Books. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A, 4B, 4C, Philosophy 1, 10B, Religious Studies 21, 40, or any course from the GE Literature Preparation 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 alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A, 4B, 4C, Philosophy 1, 10B, Religious Studies 21, 40, or any course from the GE Literature Preparation 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) II. Morris
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3, or standing above freshman level. American humorous vision of man, nature, and the supernatural. Includes one or more of the following: colonial humor; southwestern and New England humor; pre- and post-Civil War masters; local colorists; journalistic gadflies; anti-provincialists; modernist poets and prose writers; black humor.

177. Study of an Individual Author (4) III. Morris
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Survey of the works of an individual author other than Chaucer, Shakespeare, or Milton. May be repeated for credit when a different author is studied.

178. Special Topics in Ethnic Literature (4) II. Kramer
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3, or sophomore standing or above. Extended study of a topic drawn from the multi-ethnic literature of the United States. Course may focus on particular ethnic groups, historical periods, writers, genres, and/or themes. May be repeated for credit when subject matter differs.

179. Multi-Ethnic Literature (4) I. Stange
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) I. ———
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Historical backgrounds and development of types of children's literature, folklore and oral tradition, levels of interest, criticism and evaluation, illustration and bibliography.

181. Black Literature (4) III. Major
Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. A study of the writings of black Americans, including Chesnut 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 alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: English 3, Comparative Literature 1, 2, or 3.

***184. Literature of the Wilderness (4)**

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. Study of the theme of wilderness primarily in American Literature, with some consideration of Biblical and European antecedents. Major attention given to Thoreau, Muir, London, Austin, Faulkner, Snyder, and Abbey. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: English 3, History 17A, or 17B.

185A. Literature by Women I (4) II. Stange

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3. English language literature by women from Bradstreet and Behn to the Brontës, Eliot, and Dickinson. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

185B. Literature by Women II (4) III. S. Gilbert

Lecture/discussion—3 hours; term paper. Prerequisite: course 1 or 3; course 185A recommended. English language literature by women from Chopin and Woolf to Plath, Rich, and Morrison. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

***187. Literature and the Other Arts (4) III. Stange**

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of the relationship between the forms of literature and the forms of the other arts, with detailed study of one of the crucial periods of artistic development in western culture.

188. Special Topics in Literary Studies (4) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of a special topic drawn from English or American literature. Course will be offered in sections according to the topic studied, and papers will be assigned. Limited enrollment. May be repeated for credit with consent of instructor.

189. Seminar in 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)

Internship—3-36 hours. Prerequisite: course 1 or 3. Internships in fields where students can practice their skills. A maximum of 4 units is allowed toward the major in English. May be repeated for credit for a total of 12 units. (P/NP grading only.)

194H. Special Study for Honors Students (4) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Prerequisite: admission to English Department Senior Honors Program. Study of a special literary topic or of the works of a major writer, and preparation for writing an honors thesis in course 195H.

195H. Honors Thesis (4) II. The Staff (Chairperson in charge)

Independent study—12 hours. Prerequisite: course 194H. Preparation of a thesis, under the supervision of an instructor. Students satisfying requirements for the general major or the teaching emphasis write on a scholarly or critical subject; creative writing students submit a volume of poems or fiction.

197T. Tutoring in English (1-5) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-5 hours. Prerequisite: upper division standing and consent of Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. Does not fulfill requirement for major. May be repeated for credit for a total of 8 units. (P/NP grading only.)

197TC. Community Tutoring in English (1-4) I, II, III. The Staff (Chairperson in charge)

Tutoring—1-4 hours. Prerequisite: upper-division standing and a major in English; consent of Chairperson.

Field experience, with individuals or in classroom in instruction of English language, literature, and composition. Does not fulfill requirement for major. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: one course from courses 1, 3, 5F, 5P. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses**200. Techniques of Literary Scholarship (4) II. Schleiner**

Discussion—3 hours; term paper. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.

201. Literary Criticism (4) I. Torrance

Discussion—3 hours; term paper. Survey of the major critics from Aristotle to the present, with emphasis on the relationship of critical theory to the history of literature.

***205. 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) III. Osborn**

Discussion—3 hours; oral and written reports; conferences with students. Prerequisite: course 205 or the equivalent. A study of the poem and the Heroic Age of Germanic literature. Offered in alternate years.

207. Middle English (4) II. Cioffi

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

Seminar—3 hours; conference—1 hour. Prerequisite: upper division English course in area to be studied. Offered in multiple sections each quarter. Content varies according to specialty of instructor. Course designed for students preparing for their comprehensive examinations. May be repeated for credit.

215. Arthurian Romance (4) II. Osborn

Seminar—3 hours; conference—1 hour. 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) I. McGuinness**
Seminar—3 hours; conference—1 hour. Prerequisite: course 139. Course will vary from quarter to quarter and will include such topics as the nineteenth-century novel, contemporary Irish poetry, rise of the drama, or a study of a major author.

230. Study of a Major Writer (4) II. _____

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)**

Seminar—3 hours; conferences with individual students—1 hour. Selected issues in the current study and critical assessment of a limited period or topic in English literature. May be repeated for credit when different period or topic is studied.

233. Problems in American Literature (4) I. Morris; II. Zender; III. Snyder

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) II. Cohn (Dramatic Art)
Seminar—3 hours; conference—1 hour. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.

235. Theory of Fiction (4) II. Baker

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) III. Snyder

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) I. Hoffman**

Seminar—3 hours; conference—1 hour. Examination of problems in the theory underlying the practice of literary criticism from I.A. Richards and T.S. Eliot to the present.

238. Special Topics in Literary Theory (4) II. S. Gilbert

Seminar—3 hours; term paper. Prerequisite: course 237 or the equivalent. Advanced topics in literary theory and criticism. Preparation and evaluation of research paper. May be repeated for credit when topic and/or reading list differs. Offered in alternate years.

***240. Medieval Literature (4)**

Seminar—3 hours; conference—1 hour. Studies of Medieval literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

242. Sixteenth-Century Literature (4) III. Waddington
Seminar—3 hours; conference—1 hour. Studies in sixteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

244. Shakespeare (4) I. Levin

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) I. _____

Seminar—3 hours; conference—1 hour. Studies in eighteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

250. Romantic Literature (4) II. Lokke; III. Hayden
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. Dale

Seminar—3 hours; conference—1 hour. Studies in Victorian literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

254. Twentieth-Century British Literature (4) III. Hoffman

Seminar—3 hours; conference—1 hour. Studies in twentieth-century British literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

256. Early American Literature (4) III. 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. Stange 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)** 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) I. Moran Seminar—3 hours; conference—1 hour. Studies in literature by women and the theoretical approaches to literature by women. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when topic and/or reading list differs.

290F. Seminar in Creative Writing of Fiction (4) I. Major; II. Byrd; III. Tallent Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in master's program in Creative Writing. Writing of prose. Evaluation of written materials and individual student conferences. May be repeated for credit.

290NF. Seminar in Creative Writing of Non-Fiction (4) II, III. The Staff (Chairperson in charge) Seminar—3 hours; term paper. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in the Master's Program in English (Creative Writing). A workshop in the writing of literary non-fiction, with emphasis — according to staff and student interest — on autobiography, biography, memoir, the occasional or nature essay, or other non-fiction prose narratives.

290P. Seminar in Creative Writing of Poetry (4) I. McPherson; II. Williamson; III. S. Gilbert 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) I. _____

Lecture-discussion—3 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. _____

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. _____

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. _____

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) II, III. The Staff

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. _____

(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. Robertson

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. _____

Seminar—2 hours; conference—1 hour. Prerequisite: participation in Creative Writing Program. Approved for graduate degree credit. 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.)

Hugh Dingle, Ph.D., Professor
Sean S. Duffey, Ph.D., Professor
Lester E. Ehler, Ph.D., Professor
Bruce F. Eldridge, Ph.D., Professor
Norman E. Gary, Ph.D., Professor
Jeffrey Granett, Ph.D., Professor
Albert A. Grigarick, Jr., Ph.D., Professor Emeritus
Bruce D. Hammock, Ph.D., Professor (*Entomology, Environmental Toxicology*)

Charles L. Judson, Ph.D., Professor Emeritus
Richard Karban, Ph.D., Associate Professor
Harry K. Kaya, Ph.D., Associate Professor
Lynn S. Kimsey, Ph.D., Associate Professor
Harry H. Laidlaw, Jr., Ph.D., Professor Emeritus
W. Harry Lange, Jr., Ph.D., Professor Emeritus
G. A. H. McClelland, Ph.D., Senior Lecturer, S.O.E.
Donald L. McLean, Ph.D., Professor Emeritus
Susumu Maeda, Ph.D., Assistant Professor
Robert E. Page, Ph.D., Associate Professor
Michael P. Parrella, Ph.D., Associate Professor (*Entomology, Environmental Horticulture*)

Christine Y. S. Peng, Ph.D., Associate Professor
Timothy Prout, Ph.D., Professor Emeritus (*Entomology, Genetics*)

Richard E. Rice, Ph.D., Lecturer
Jay A. Rosenheim, Ph.D., Assistant Professor
Arthur Shapiro, Ph.D., Professor (*Entomology, Zoology*)

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
Frank G. Zalom, Ph.D., Lecturer

The Major Program

The Entomology major is a general biological curriculum of interest to students intrigued by insects, their diversity and biology. Areas of emphasis include: agricultural entomology, bee management and biology, behavior, ecology, insects affecting human and animal health, natural history, and physiology.

The Program. Students begin their study in entomology with selected insect biology courses. After completing these courses, students may enroll in courses in their particular area of interest. A student interested in agricultural entomology, for example, could enroll in courses such as pest management, biological control of insects, and insect-host plant interactions.

Internships and Career Alternatives. Entomology majors have participated in internships with the State Department of Agriculture in the areas of insect identification, insect surveys, and the development of entomological libraries. Other interns have worked with professional entomologists in the area of supervised pest control. Graduates are prepared for managerial and technical positions with state and federal agencies and agricultural production or supporting industry; entomology graduates also teach biological sciences in high schools. Others matriculate in graduate programs leading to a higher degree.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable and may be critical for the attainment of some career goals. Courses shown without parentheses are required.)

English Composition Requirement	0-8
See College Requirement	
Preparatory Subject Matter	46-47
Biology (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Mathematics 16A	3
Physics (Physics 1A, 1B)	6
Statistics (Statistics 13, 32, or Agricultural Science and Management 150)	3-4
Computer science or additional statistics (Agricultural Science and Management 21, Engineering 5, or Mathematics 18B).....	3

Entomology

(College of Agricultural and Environmental Sciences)
_____, Ph.D., Chairperson of the Department
Department Office, 367 Briggs Hall (916-752-0475)

Faculty

Oscar G. Bacon, Ph.D., Professor Emeritus
Richard M. Bohart, Ph.D., Professor Emeritus
James R. Carey, Ph.D., Associate Professor

*Course not offered this academic year.

Breadth Subject Matter24	
Satisfaction of General Education requirement.....6-24	
Depth Subject Matter32-36	
Cell or microbiology (Microbiology 102, Botany 114, 199, Plant Pathology 120, Veterinary Microbiology and Immunology 132).....4-6	
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	
Entomology 100, 100L.....5	
At least 7 units from Entomology 101, 102, 103, 104, 107, 109, or 116.....7	
Restricted Electives34	
Upper division entomology courses.....14	
Upper division electives related to student's interest with approval of adviser.....14	
Note: No more than a total of 6 units from Entomology 192, 197T and 199 may count toward fulfilling depth subject matter or restricted elective units.	
Unrestricted Electives31-55	
Total Units for the Major180	

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.

	UNITS
Entomology18-19	
Entomology 100, 100L.....5	
At least two courses from Entomology 101, 102, 103, 104, 107.....7-8	
At least two additional upper division Entomology courses (except courses 192, 198, 199).....6	
	UNITS
Agricultural Entomology19-21	
Entomology 100, 100L, 110, 115, 135.....17	
	UNITS
Apiculture18	
Entomology 100, 100L, 119, 119L.....10	
Entomology 104 or 110.....4	
Additional courses recommended: Agronomy 120, Botany 102, Pomology 102....4	
	UNITS
Insect Ecology20	
Entomology 100, 100L, 104.....9	
Seven units from Entomology 103, 107, 109.....7	
Zoology 149 or Environmental Studies 121.....4	
	UNITS
Medical-Veterinary Entomology18	
Entomology 100, 100L, 104, 153, 156.....16	
At least two units from Entomology 155, 156L, Veterinary Microbiology and Immunology 126, 126L, 128, 132.....2	

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. Dingle, Kaya
Lecture—3 hours. Designed for students not special-

izing in entomology. Not open for credit to students who have had course 100, but students who have taken this course may take course 100 for credit. An introduction to the insects detailing their great variety, structures and functions, habits, and their significance in relation to plants and animals including man.

17. Natural Selection and Sociobiology (4) I. Karban
Lecture—3 hours; discussion—1 hour. Introduction to the theory of natural selection, using evaluations and applications of behavioral adaptations, ranging from insects to humans. General Education credit: Nature and Environment/Introductory.

99. Special Study for Undergraduates (1-5) I, II, III.
The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. General Entomology (3) I. Granett in charge
Lecture—3 hours. Prerequisite: Biological Sciences 1A. Biology, anatomy, physiology, development, classification, ecology and relation of insects to human welfare.

100L. General Entomology Laboratory (2) I.
Granett in charge
Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). Anatomy, development, population ecology, methods of collecting, classification and identification of insects of all orders and of major families.

101. Functional Insect Morphology (3) II. Peng
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100. Study of the basic external and internal structures, organs and tissues of insects, with emphasis on functional systems. Functional anatomy, histology and fine structures of important organs and tissues will be discussed.

102. Insect Physiology (4) III. Duffey, Hammock,
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or course in physiology or invertebrate zoology. Processes by which insects maintain themselves, reproduce, and adapt to environment. Insects as models for basic/applied research through detailed analysis of metabolic, physiological, and behavioral processes. Emphasis on analysis of methodology, fact, and theory.

103. Insect Systematics (3) III. Ward
Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in zoology or entomology. Principles and methods of systematics, with particular reference to insects. Emphasis on different theories of classification, and analysis of phylogenetic relationships.

104. Behavioral Ecology of Insects (3) II. Page
Lecture—3 hours. Prerequisite: introductory biology or zoology. Basic principles and mechanisms of insect behavior and ecology. An evolutionary approach to understanding behavioral ecology of insects.

107. California Insect Diversity (5) III. Thorp, Kimsey
Lecture—1 hour; laboratory—6 hours; fieldwork—6 hours. Prerequisite: an introductory course in entomology. Survey of the diversity of insects from selected ecological zones in California with emphasis on collection, identification, and natural history. Offered in alternate years.

109. Field Taxonomy and Ecology (7) Extra-session summer. Ward
Lecture—2 hours; laboratory—36 hours; five-week course. Prerequisite: an introductory course in entomology or consent of instructor. The study of insects in their natural habitats; their identification and ecology. Offered in alternate years.

110. Economic Entomology (4) I. Parrella
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.

111. Insects and Human Affairs (4) II, III. McClelland
Lecture—2 hours; discussion—1 hour; film/demon-

stration—1 hour; one required evening meeting. Prerequisite: Biological Sciences 10 recommended. Diversity, structure and function of insects. Their role as benefactors, competitors, and destroyers of human resources and health. Their contribution to human culture and scientific knowledge. Approaches to insect pest control and its environmental, social and political correlates. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10.

115. Arthropod Management in Agriculture (4) II. Granett

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or 110. Principles of integrated pest management with emphasis on arthropod pests in California crop systems. Definition of pest status, measurement of pest damage, and interactions between pests and plants. Integration of control tactics. Use of insecticides within the IPM framework.

116. Biology of Aquatic Insects (3-5) III. The Staff
Lecture—2 hours and laboratory (Saturday field trips); optional laboratory on identification and/or aquatic insect collection. Prerequisite: course 100 or consent of instructor. A study of the life history, ecology, and identification of insects associated with streams, ponds, and lakes.

119. Apiculture (3) II. Gary
Lecture—3 hours; papers. Prerequisite: Biological Sciences 1C recommended. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10 or Botany 10.

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 and biochemical interaction between various organisms, particularly plants and insects.

135. Introduction to Biological Control (4) III. Ehler, Kaya

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or 110. Principles of biological control of arthropod pests and weeds. Biology of pathogens, entomopathogenic nematodes, parasitoids, and predators. Implementation in classical and augmentative biological control. Role of biological control in pest management.

147. Historical Biogeography and Evolution of Biodiversity (4) III. Kimsey

Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 10 or Biological Sciences 10. Designed for non-majors. Explores the relationships between physical changes in the continents and the evolution and diversification of plants and animals, particularly insects, over the past 400 million years. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Botany 10 (or Botany 2), or Biological Sciences 10 (or Zoology 2).

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. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Entomology 111 or any

other course in the biological sciences.

156. Biology of Parasitism (3) III. Washino in charge; Theis (Medical Microbiology), Maggenti (Nematology)

Lecture—3 hours. Prerequisite: Biological Sciences 1A or consent of instructors. Lectures on the biological and ecological aspects affecting host-parasite relationships using selected examples from protozoan and metazoan fauna.

156L. Biology of Parasitism Laboratory (1) III.

Washino in charge; Theis (Medical Microbiology), 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)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Laboratory experience or fieldwork off and on campus in all subject areas offered in the Department of Entomology. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Entomology (1-3) I, II, III. McClelland

Discussion—1-3 hours. Leading small discussion groups. Preview assignments and prepare guidelines for discussion. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, summer.

The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, summer. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200A. Conceptual Basis of Entomology: Basic Biology (4) II. Duffey

Lecture—3 hours; discussion—1 hour. Selected advanced topics in contemporary entomological research with an emphasis on theoretical and fundamental aspects of natural selection, behavior, ecology, physiology, and biochemistry as relates to the regulation of insect populations. Provides the theoretical framework for course 200B.

200B. Conceptual Basis of Entomology: Application (4) III. Parrella

Lecture—3 hours; discussion—1 hour. Selected advanced topics in contemporary entomological research with emphasis on the application of theoretical/conceptual outlines from course 200A to epidemiology, biotechnology, biological control and integrated pest management for pursuing current insect pest problems concerning food, fiber, and health.

205. Insect Demography (3) III. Carey

Lecture—3 hours. Prerequisite: Ecology 104, Mathematics 16B. Concepts and methods of mathematical demography as applied to insect populations; reasoning behind demographic calculations. Mechanisms of calculations stressed. (S/U grading only.) Offered in alternate years.

212. Molecular Biology of Insects and Insect Viruses (2) II. Maeda

Lecture—2 hours. Prerequisite: consent of instructor. A molecular biological analysis of insect systematics, physiology, and defense mechanisms. Molecular biology of insect viruses. Baculovirus expression vectors and post-translation modification of expressed polypeptides. Biological control of using neuropeptides and toxin genes in insect viruses.

219. Advanced Apiculture (4) III. Peng

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119L. Current topics in bee biology with special consideration of morphology, caste determination, queen rearing, nutrition, physiology, pathology, and products of honey bees. Offered in alternate years.

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.

230. Advanced Biological Control (3) I. Ehler

Lecture—2 hours; discussion—1 hour. Prerequisite: course 135. Advanced treatment of current topics in biological control of arthropod pests and weeds. Offered in alternate years.

253. Advanced Medical Entomology (3) III.

McClelland

Lecture—2 hours; discussion—1 hour. Prerequisite: one upper division course in entomology (other than course 153) and one course in microbiology: course 153 strongly recommended. An analysis of several anthropod-borne human diseases with emphasis on the relationships of the biology of the vector to the ecology of the disease. Discussion includes demonstration of vectors and techniques. Offered in alternate years.

290. Special Topics in Entomology (1-4) I, II, III.

The Staff (Chairperson in charge)

Seminar—1-4 hours. Prerequisite: consent of instructor.

291. Seminar in Medical Entomology (2) I. McClelland, Washino, Eldridge

Seminar—2 hours. Prerequisite: course 153. Discussions of parasitology, ecology and epidemiology related to vectors of pathogens causing disease in man and animals.

292. Seminar in Insect Physiology (2) I. Duffey,

Hammock, Maeda

Seminar—2 hours. Prerequisite: course 102. Critical examination of areas of current interest to insect physiology and biochemistry.

293. Seminar in Systematic Entomology (2) III.

Ward, Thorp, Kimsey

Seminar—2 hours. Prerequisite: course 103. Selected topics in systematics and evolution are presented and discussed. Some topics may be illustrated by laboratory sessions.

294. Seminar in Insect Ecology (2) III. Carey, Ehler, Karban

Seminar—2 hours. Prerequisite: a general ecology course. Discussions of advanced topics in ecology with emphasis on analysis of factors influencing the distribution and abundance of insects. Includes consideration of applications of basic theory as in biological control and related approaches.

295. Seminar in Agricultural Entomology (2) II.

Granett, Parrella, Rosenheim

Seminar—2 hours. Prerequisite: course 110. Discussion of advanced topics relating to the principles of pest insect population management.

296. Seminar in Bee Biology (2) I. Gary, Thorp,

Page, Peng

Seminar—2 hours. Prerequisite: course 119 or the equivalent. Discussions of behavior, ecology, management, and general biology of bees (Apoidea) with emphasis on the honeybee.

297. Seminar in Insect Behavior (2) III. Gary, Dingle

Seminar—2 hours. Prerequisite: a course in animal behavior. Review and critical analysis of contemporary advances in insect behavior, especially interpretation and description of observations, physiological mechanisms, functional kinds of behavior, and the application of general principles to the solution of problems in the laboratory and field.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III, summer. The Staff

(Chairperson in charge)

(S/U grading only.)

Professional Courses

403. Oral Presentation of Scientific Information

(1) I. Granett, Duffey

Lecture-discussion—2 hours every other week. Prerequisite: graduate standing. Approved for graduate degree credit. Helps students in preparing information for (1) 8- to 10-minute talks at scientific meetings, (2) research seminars, (3) class lectures, and (4) impromptu talks.

404. Grantsmanship (2) I. Granett, Duffey

Lecture—1 hour; 15-20 page research proposal required. Prerequisite: graduate standing; research experience. Approved for graduate degree credit. Develops in students an awareness of options and strategies in writing research proposals. Students write a full-length research proposal.

406. Analysis of Natural Products (2) I. Duffey

Lecture—1/2 hour; discussion—1/2 hour; laboratory—2 hours. Prerequisite: Biochemistry 101B. Approved for graduate degree credit. Familiarizes students with basic methods of isolating, identifying, and bioassaying natural products.

Environmental and Resource Sciences

See Atmospheric Science; Range and Wildlands Science; Resource Sciences; Soil Science; Water Science; and Wildlife and Fisheries Biology

Environmental Biology and Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Division of Environmental Studies.

The Major Program

The environmental biology and management major offers an education in the basic natural sciences, especially ecology, together with a set of management and public policy analysis courses. Students completing the program will understand the scientific basis for environmental decision making, and the legal, economic, and political issues involved in management of the environment in the United States and worldwide.

The Program. Courses in chemistry, physics, mathematics, biology, and earth sciences form the foundation of the curriculum; these are then tied together by courses in ecology. Computing, statistics, and other methods courses give the student basic quantitative research skills. Economics, political science, and techniques of quantitative management offerings dominate the management and public policy requirements.

A moderate degree of specialization is permitted in two upper division options. Students in the *Environmental Biology* option take course work in population ecology, physiology, and other biological specialties, as well as quantitative analysis. Students in the *Environmental Management* option take courses in recreation, resource economics, planning and public policy, and, especially, quantitative management techniques. The option emphasizes the management of public lands and natural resources in wildland and rural areas. Practical courses in field level planning and management are featured. Students interested in urban problems and/or legislative approaches should examine the Environmental Policy Analysis and Planning major.

Career Alternatives. The major prepares students to enter careers in management of natural resources and public lands, as well as basic ecological research. Students interested in professional schools, e.g., medicine, should consult an adviser early to plan for their special requirements, such as organic chemistry. Graduates who chose the Environmental Biology option are prepared for graduate or professional training and, eventually, careers working for public agencies and private firms specializing in environmental quality, natural resources, or ecological research. Graduates with the Environmental Management option are prepared for jobs in public agencies at the federal, state, or local levels.

B.S. Major Requirements:

(The *usual* courses taken to satisfy requirements are shown in parentheses. Equal or more comprehensive courses may be taken with the adviser's written approval. *Courses shown without parentheses are required.*) Students will be required to plan their course selection with their adviser.

UNITS

English Composition Requirement	6-11
See College requirement	0-8
Additional English (English 102 concurrently with Environmental Studies 1)	3
Oral expression (Rhetoric and Communication 1 or Dramatic Art 10)	3-4
Preparatory Subject Matter	43-47
Biological sciences (Biological Sciences 1A)	5
Chemistry (Chemistry 1A-1B or 4A-4B) ...	10
Computer Science (Agricultural Science and Management 21, Computer Science Engineering 10, or Engineering 5)	3
Ecology of biomes (Environmental Studies 30)	3
Environmental sciences (Biological Sciences 1B or Geology 1-1L)	4-5
Environmental/policy analysis (Environmental Studies 1, Political Science 1, or Economics 1A; choose Economics 1A if Environmental Management option is selected)	4-5
Mathematics (Mathematics 16A-16B or 21A-21B)	6-8
Physics (Physics 5A-5B or 9A-9B)	8
Breadth/General Education	12-24
Satisfaction of General Education requirement to include 12 units of humanities and/or Civilization and Culture	12-24
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, Water Science 100, 141)	6-8
Environmental Policymaking/Resource Economics, Environmental Studies 160, 161, or 165; Agricultural Economics 147, 176; or Economics 123	3-4
(Choose Agricultural Economics if Environmental Management option is selected.)	
Management of Public Lands, Environmental Studies 172	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 Science 115, 15 units, or Environmental Studies 124, 10 units.)	

Areas of Specialization.....31-44

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)†	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.	

Environmental Management Option

Recreation, Environmental Studies 162	4
Microeconomics, Economics 100	5
Policy evaluation, Environmental Studies 168A	4
Bureaucratic Policy Making, Environmental Studies 160, 166, or Political Science 182	4
Quantitative Resource Management, Agricultural Economics 155, 157, or Environmental Studies 168B	4
Environmental Management, Environmental Studies 171 or 179	3-4
Engineering Planning, Civil Engineering 152, 160, or 175	3
Statistical Analysis, Sociology 106, Statistics 108, or Agricultural Economics 106	4
Management of a natural resource, two courses from one of the following three groups	6-8
<i>Animal Resources:</i> Range Science 135, or Wildlife and Fisheries Biology 111, 122, 151, or Resource Science 101, or Environmental Studies 123.	
<i>Forest and Rangeland Resources:</i> Resource Science 2, or Range Science 133, 134, 145	
<i>Air, Water, and Soil Resources:</i> Resource Science 131, or Water Science 41, 103, 122, 141, or Geography 162, or Soil Science 118, or Environmental Studies 151L.	

Unrestricted Electives

Total Units for the Degree.....180

Major Adviser: J.F. Quinn (*Environmental Studies*).

†Most of these courses require one or two additional chemistry or basic physiology courses as prerequisites. Plan a sequence in consultation with adviser.

Minor Program Requirements:

The faculty for Environmental Biology and Management offers a minor in Recreation for students in Landscape Architecture desiring to specialize in recreation area design; Physical Education, Psychology, Sociology, Human Development, and Applied Behavioral Sciences students wishing to work in educational and therapeutic recreation; Environmental Policy Analysis and Planning students seeking careers in public recreation policy analysis and management; Agricultural and Managerial Economics students wishing to go into the administration of

commercial recreation enterprises; and those students in Plant Science interested in park landscape construction and maintenance.

UNITS

Recreation.....18-20

Resource economics, (Agricultural Economics 147, 176, Economics 123) ...	3-4
Urban recreation programs, (Environmental Biology and Management 134, Physical Education 150)	3-4
Recreation policy analysis, Environmental Studies 162	4
Recreation administration, (Agricultural Economics 112, Applied Behavioral Science 163, 170, Political Science 183, 189)	4
Internship in Recreation Management, Environmental Studies 192	4

Minor Adviser: R. A. Johnston (*Environmental Studies*).

Courses in Environmental Biology and Management

Questions pertaining to courses in Environmental Biology and Management should be directed to the Environmental Biology and Management advising office, 2132 Wickson Hall.

Environmental Design

(College of Agricultural and Environmental Sciences)

Victoria Z. Rivers, M.A.C.T., S.C.T., Chairperson of the Department

Department Office, 144 Walker Hall (916-752-6223)

Faculty

Richard Berteaux, B.Arch., M.S., Associate Professor
 Frances Butler, M.A., Professor
 Kerry J. Dawson, M.L.A., Associate Professor
 Mark Francis, M.L.A., Professor
 Dolph Gotelli, M.A., Associate Professor
 Patricia Harrison, M.Arch., Assistant Professor
 Janet L. Hethorn, Ph.D., Assistant Professor
 Gyöngy Laky, M.A., Professor
 E. Byron McCulley, B.S.L.A., Adjunct Professor
 Edward S. McNeil, M.L.A., Assistant Professor
 Helge B. Olsen, Senior Lecturer, S.O.E.
 Patsy E. Owens, M.L.A., Assistant Professor
 Susan Palmer, M.A., Lecturer
 Victoria Z. Rivers, M.A.C.T., S.C.T., Professor
 Katherine W. Rossbach, M.A., Professor Emeritus
 Barbara Shawcroft, M.F.A., Professor
 Heath Schenker, M.A., Assistant Professor
 JoAnn C. Stabb, M.A., Senior Lecturer, S.O.E.
 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 Geology

(College of Letters and Science)

The minor in Environmental Geology examines the multidisciplinary factors of geology and related earth science fields, and planning and resources oriented programs.

Students in the minor are encouraged to participate in internship programs that assist them in solidifying the Environmental Geology minor with their Geology

major or other major field areas that include geologic components.

The minor is sponsored by the Department of Geology, 174 Physics/Geology. Faculty adviser: Robert A. Matthews, Department of Geology, 397 Physics/Geology, 752-0179.

Minor Program Requirements:

UNITS

Environmental geology	23-25
Geology 130, 134, and 152 or Geography 106	10
Soil Science 118.....	4
Water Science 141 or Civil Engineering 142	3
Two courses chosen from:	
Environmental Studies 160, 171, 179; Geology 135, 154 or Geography 108; Resource Sciences 100; Water Sciences 149	6-8

Environmental Horticulture

(College of Agricultural and Environmental Sciences)

James A. Harding, Ph.D., Chairperson of the Department

Department Office, 140 Environmental Horticulture Building (916-752-0130)

Faculty

Allison M. Berry, Ph.D., Assistant Professor
David W. Burger, Ph.D., Associate Professor
Thomas G. Byrne, M.S., Lecturer
Don J. Durzan, Ph.D., Professor
Richard Y. Evans, Ph.D., Lecturer
Seymour M. Gold, Ph.D., Professor
James A. Harding, Ph.D., Professor
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 Emeritus
J. Heinrich Lieth, Ph.D., Assistant Professor
James D. MacDonald, Ph.D., Associate Professor
(Plant Pathology)

John H. Madison, Jr., Ph.D., Professor Emeritus
Carolyn Napoli, Ph.D., Assistant Professor
Jack L. Paul, Ph.D., Professor Emeritus
Michael S. Reid, Ph.D., Professor
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 Biology 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. Classification, nomenclature, and identification of common trees, shrubs, ground covers, turf-grasses, bedding plants, and house plants. Characteristics of important plant families are discussed.

10. Landscape Horticulture for the Home and Community (3) III. Burger

Lecture—2 hours; discussion—1 hour. Recommended for non-majors. Influences of climate, soil, and cultural practices on the growing of turf, flowers, and herbaceous and woody plants in the landscape.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)

Internship—3-36 hours. Prerequisite: lower division standing, Biological Sciences 1C or Plant Science 2 or 10, and consent of instructor. Work experience off and on campus in flower and nursery crop production, and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Sachs in charge) (P/NP grading only.)

Upper Division Courses

105. Taxonomy and Ecology of Environmental Plants (4) I. ———

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.

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. Napoli, Lieth

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Plant Science 2. Principles and techniques necessary for the greenhouse and nursery production of ornamental crops.

130. Turfgrass Culture (3) III. Wu
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or Biological Sciences 1C 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—4 hours. Prerequisite: Plant Science 2 or Biological Sciences 1C. Principles and practices of selecting, planting and maintaining trees, shrubs, and vines in urban and natural landscapes. Course given in individualized 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)

Internship—3-36 hours. Prerequisite: completion of 84 units, two upper-division courses in Environmental Horticulture appropriate for the internship, and consent of instructor. Work experience off and on campus in flower production and marketing, nursery crop production and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff

Hours and duties will vary depending on course tutored. Prerequisite: upper division standing, completed course or the equivalent being tutored, and consent of instructor. Leading discussion sections, conducting laboratory exercises or proctoring in individualized instruction format classes under faculty guidance. Weekly conferences on subject matter and instructional techniques. May be repeated once for credit if different course is tutored.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

Graduate Courses

220. Tree Biotechnology (2) II. Durzan

Lecture—2 hours. Prerequisite: Bachelors or Masters degree in a plant science discipline (botany, plant physiology, genetics, horticulture, related fields). Develop understanding of basic principles of biotechnology of woody perennials. Cell and tissue culture methods and current process control problems are emphasized. Recombinant DNA methods covered where appropriate. Develop analytical evaluation skills. Review trends in commercialization.

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 alternate 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 alternate years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Research conference conducted by departmental faculty to discuss design, philosophy, and interpretation of ongoing specific research areas which include plant morphogenesis, floriculture, greenhouse production and modeling, landscape plant ecology, arboriculture, turf culture, post harvest, plant breeding, etc. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. Lieth, Napoli, Reid, Sachs, Wu

Discussion—1 hour. Prerequisite: students in a plant science graduate program. Research conference conducted by departmental faculty to discuss design, philosophy, and interpretation of ongoing specific research areas which includes plant morphogenesis, floriculture, greenhouse production, landscape plant ecology, arboriculture, turf culture, post harvest, and plant breeding related to environmental horticulture. (S/U grading only.)

297T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff (Chairperson in charge)

Tutoring—4 to 8 hours; discussion—1 hour. Prerequisite: graduate student standing; completion of course to be tutored (or the equivalent) and/or consent of instructor. Leading discussion sessions, conducting laboratory exercises, and lecturing in Environmental Horticulture classes under faculty guidance. Weekly conference on subject matter and instructional 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.)

Courses in Environmental Planning and Management

Questions pertaining to the following courses should be directed to the instructor or to the Environmental Biology and Management advising office, 2132 Wickson Hall.

Upper Division Courses

110. Urban and Regional Planning (4) II. Gold (Environmental Horticulture)

Lecture—3 hours; discussion—1 hour; one Saturday

field trip. Prerequisite: upper division standing. The history, nature, scope, and significance of planning in America with emphasis on basic definitions and concepts, the planning process and comprehensive plan, significant problems and potentials, design alternatives, the future, innovation, and the profession.

134. Recreation Planning (4) III. Gold
Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: courses 110, 116. Description of basic concepts, principles, techniques and methods used to prepare park, recreation, and open space plans for urban environments.

Environmental Planning and Management

See Environmental Biology and Management; and Environmental Horticulture

Environmental Policy Analysis and Planning

(College of Agricultural and Environmental Sciences)

The Major Program

The major in environmental policy analysis and planning develops an understanding of governmental policy-making and skills for analyzing policy in fields related to environmental quality.

The Program. This major provides students with a general background in the natural sciences relevant to environmental policy. It also provides sufficient training in mathematics, statistics, and research methodology to quantitatively analyze environmental problems and policy options. A strong background in policy analysis, including the evaluation of policy alternatives and the study of factors affecting policy formulation and implementation is included. In addition, students are encouraged to develop substantive knowledge in a specific field of environmental policy, such as urban and regional planning, water pollution control, or energy.

Career Alternatives. Environmental policy analysis and planning graduates are prepared for employment in public agencies, consulting firms, and businesses concerned with environmental affairs. The major is also excellent preparation for students who want to go on to graduate work in law, planning, public policy, or management.

B.S. Major Requirements:

(Courses in parentheses are those normally taken. Very similar or more difficult courses may be taken with the approval of your adviser. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement	10-11
See College requirement	0-8
Additional English (English 102 concurrently with Environmental Studies 1)	3
Preparatory Subject Matter	51-58
Biological sciences (Biological Sciences 1A)	5
Chemistry (Chemistry 1A, 1B)	10
Computer science (Agricultural Science and Management 21, Engineering 5, Computer Science Engineering 10, 30)	3-4

Economic principles (Economics 1A, 1B)	10
Environmental science/agriculture (Animal Science 1, Biological Sciences 1B, Geography 1, Geology 1, Plant Science 10, Soil Science 100, Water Science 100, 104)	3-5
Environmental studies (Environmental Studies 1)	4
Mathematics (Mathematics 16A-16B or 21A-21B)	6-8
Physics (Physics 1A)	3
Political science (Political Science 1)	4
Statistics (Statistics 13, 32)	3-4
Breadth/General Education	6-24
Satisfaction of General Education requirement	6-24

Depth Subject Matter	37-40
(Students must take these units on a letter grade basis, and must attain an overall grade-point average of 2.000 or higher in the Depth Subject Matter courses.)	

Core Courses	
Environmental Studies 160	4
Environmental Studies 161, 173, or Water Science 150	3-4
Environmental Studies 166	4
Environmental Studies 168A	4
Environmental Studies 171 or 179	3-4
Environmental Studies 110	4
Environmental Studies 164	4
Research Methods	
Environmental Studies 178; or Sociology 103	4
Sociology 106 or Agricultural Economics 106 or Statistics 108	3-4

Economic Analysis	
Economics 100	5
Agricultural Economics 176	3
Areas of Specialization (choose one)	17-23

Advanced Policy Analysis Option	
Political Institutions (Political Science 102, 105, 108, 155, Environmental Studies 162)	4
Political behavior (Political Science 164, 165, 170)	4
Science policy (Environmental Studies 165)	4
Policy evaluation research (Environmental Studies 168B)	4
Policy evaluation (Civil Engineering 153, 160, Agricultural Economics 155, Economics 125, 130)	3-4

City and Regional Planning Option	
Urban design (Art 168, Environmental Biology 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 125)	4
Urban politics (Political Science 102, 100)	4
(Enroll for Environmental Studies 173 for law requirement under Depth Subject Matter above.)	

Energy Policy Option	
Environmental health (Environmental Studies 126, Environmental Toxicology 101)	4
Nuclear hazards (Environmental Studies 115)	3
Energy technology (Engineering 160, 162)	4
Solar energy (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 149)	3-4
Science policy (Environmental Studies 165)	4

Recreation Policy Option	
Internship in Recreation Management, Environmental Studies 192	4
Public Land Management, Environmental Studies 172	4
Urban recreation programs (Environmental Biology and Management 134, Physical Education 150)	3-4
Recreation policy analysis, Environmental Studies 162	4
Recreation administration (Agricultural Economics 112, Applied Behavioral Science 163, 170, Political Science 183, 189)	4

Transportation Planning Option	
Urban structure (Geography 155, 156, Economics 125)	4
Transportation planning (Civil 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	24-59
Total Units for the Degree	180

Major Adviser. S. I. Schwartz (Environmental Studies).

Minor Program Requirements

The faculty for environmental policy analysis and planning offers the following two minors. The Energy Policy minor is for students from any major seeking basic training in energy technology, impacts and policy analysis methods applied to energy systems. The second minor is intended for natural and social science students desiring basic training in policy analysis theory and methods.

UNITS

Energy Policy	18-19
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

*Course not offered this academic year.

UNITS

Environmental Policy Analysis	23-24
Preparation: Economics 1A; basic course in political science.	
Environmental Studies 110, 160, 161, 166, 168A.....	20
Environmental Studies 171 or 179.....	3-4
Minor Adviser. S. I. Schwartz (<i>Environmental Studies</i>).	

Environmental Studies

(Intercollege Division)

Charles R. Goldman, Ph.D., Chairperson of the Division

Division Office, 2132 Wickson Hall (916-752-3026)

Faculty

Theodore C. Foin, Jr., Ph.D., Professor
 Charles R. Goldman, Ph.D., Professor
 William J. Hamilton III, Ph.D., Professor
 Susan Harrison, Ph.D., Assistant Professor
 Alan M. Hastings, Ph.D., Professor
 Robert A. Johnston, M.S., Professor
 John B. Loomis, Ph.D., Associate 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., Associate Professor
 Eliska Rejmankova, Ph.D., Assistant Professor
 Peter J. Richerson, Ph.D., Professor
 Paul A. Sabatier, Ph.D., Professor
 Thomas W. Schoener, Ph.D., Professor (*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*)
 Geoffrey A. Wandersforde-Smith, Ph.D., Associate Professor (*Environmental Studies, Political Science*)
 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 Biology and Management and in Environmental Policy Analysis and Planning. Courses in Environmental Studies also supplement major programs in a wide variety of established disciplines, although highly motivated undergraduates who find existing majors unsuited to their educational objectives are encouraged to contact the Chairperson and faculty of the Division regarding individual majors in the College of Agricultural and Environmental Sciences (see Individual Major in the Programs and Courses section).

Current Information. Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here. Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Graduate Study. The faculty of the Division offers graduate instruction through the M.S. and Ph.D. degree programs of the Graduate Group in Ecology, as well as through the graduate programs of the disciplines with which they are associated, such as agricultural economics, zoology, sociology, political science, civil engineering, and anthropology. Further

information about graduate programs in ecology should be obtained from the Chairperson of the Graduate Group in Ecology.

Graduate Adviser. T.C. Foin (*Ecology*).

Courses in Environmental Studies

Lower Division Courses

1. Environmental Analysis (4) III. Loomis, Quinn
 Lecture—3 hours; discussion—1 hour. Prerequisite: English 1; English 102, Economics 1A, 1B, Biological Sciences 1A, and Political Science 1 recommended. Analysis of the biological, physical, and social interactions which constitute environmental problems, such as food production, energy development and conservation, pollution, and the conservation of natural environments. Emphasis on analysis of problems and the consequences of proposed solutions.

10. Introduction to Environmental Studies (4) I. Wandersforde-Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. Survey of the importance of ecology and systems behavior for man-environment relationships and management problems. Resources, environmental quality, urban dynamics, environmental perception, and conservation are covered. Includes several integrative case studies, and features individual reading in environmental problems. Not open for credit to those who have had course 1. General Education credit: Contemporary Societies/Introductory.

30. The Global Ecosystem (3) III. Richerson
 Lecture—3 hours; 1 one-day field trip. Prerequisite: Biological Sciences 10 or Geography 1 or Anthropology 2. The interaction of climate and biotic adaptation and the production of ecological systems. The limits and opportunities for human use of different natural environments, and human utilization of the earth's biotic resources. General Education credit with concurrent enrollment in course 30G: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10.

30G. The Global Ecosystem: Laboratory-Discussion (2) III. Richerson
 Laboratory/discussion—3 hours. Prerequisite: course 30 concurrently. Presents natural history skills in plant and animal identification, soils, and geology. Emphasis on the diverse organisms and habitats of Northern California. General Education credit with concurrent enrollment in course 30: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
 Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internship supervised by member of the faculty. (P/NP grading only.)

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

Upper Division Courses

100. General Ecology (4) I. Harrison
 Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology (including botanical and zoological elements); elementary calculus. Ecological principles of biological systems, emphasizing populations and ecosystems. Principles of growth, regulation, distribution, structure, energetics, and mineral cycles related to the evolution of biological systems and applications to selected human ecological problems.

101. Human Ecology (4) II. Richerson, Mulder
 Lecture—3 hours; discussion—1 hour. Prerequisite: one course from course 30, Anthropology 1, 2, Genetics 10, or the equivalent. Critical variables in the processes that relate humans and their environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability

or change in human ecological relationships. (Same course as Anthropology 101.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Environmental Studies 1, 30, Anthropology 1, 2, Biological Sciences 10, Geography 2, or Sociology 2.

(a) Environmental Science

110. Principles of Environmental Science (4) II. Powell

Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 1A or 5A, Mathematics 16B or 21B, and Biological Sciences 1A. Application of physical and chemical principles, ecological concepts, and systems approach to policy analysis of atmospheric environments, freshwater and marine environments, land use, energy supplies and technology, and other resources.

115. Bioenvironmental Consequences of Nuclear Technology (3) III. 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 alternate years. (Same course as Radiological Sciences 115.)

116. The Oceans (3) II. Suchanek, Margolis
 Lecture—3 hours. Introductory survey of the marine environment; oceanic physical phenomena, chemical constituents, geological history, the sea's biota, and utilization of marine resources. (Same course as Geology 116.) General Education credit with concurrent enrollment in course 116G: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10, Chemistry 10, or Geology 1.

116G. The Oceans: Discussion (2) II. Suchanek, Margolis
 Discussion—2 hours. Prerequisite: course 116/Geology 116 concurrently. Scientific method applied to the discovery of the processes, biota, and history of the oceans. Group discussion and preparation of papers on related topics. (Same course as Geology 116G.) General Education credit with concurrent enrollment in course 116: Nature and Environment/Non-Introductory. Recommended GE preparation: see course 116 above.

(b) Ecological Analysis

121. Population Ecology (4) II. Hastings
 Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1B, 1C, Mathematics 16A-16B. Development of exponential and logistic growth models for plant and animal populations, analysis of age structure and genetic structure, analysis of competition and predator-prey systems. Emphasis is on developing models and using them to make predictions and solve problems. Offered in alternate years.

123. Introduction to Field and Laboratory Methods in Ecology (4) III. 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; laboratory—18 hours (Summer Session I). Prerequisite: Biological Sciences 1A; Statistics 13; course 100. Full-time study at Bodega Marine Laboratory. Intensive lecture-laboratory-field study of current ecological theory and problems with emphasis on marine populations and communities; techniques and evaluation of quantitative field research.

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.

128. Analysis and Simulation of Complex Systems (3) I. Foin

Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; Statistics 102; upper division standing in the biological or social sciences. Analysis of systems and construction of simulation models of ecological and socioeconomic systems using DYNAMO; evaluation of models. Logical and scientific reasoning is stressed.

128L. Modeling Complex Systems (3) I. Foin

Lecture—1 hour; laboratory—3 hours; discussion—1 hour. Prerequisite: course 128 concurrently. Simulation modeling using DYNAMO. Students complete a series of exercises from model formulation to model experiments and develop a term project of their own choosing.

129. Physiological Ecology (4) III. Patterson

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1B, Physics 1B, and Biological Sciences 1B or 1C. Comparative and evolutionary study of organismic responses and adaptations to the physical and chemical environment. Body size and metabolism, gas and nutrient exchange, thermoregulation, biomechanics, locomotion, and selected topics in current research.

129L. Physiological Ecology Laboratory (3) III. Patterson

Laboratory—6 hours. Prerequisite: course 129 (may be taken concurrently) or the equivalent. Methods for monitoring physical variables in aquatic and terrestrial environments and animal responses to them. Water balance, respiration, and thermoregulation are demonstrated and a broadly comparative approach is considered. Enrollment limited.

(c) Cultural Ecology

133. Cultural Ecology (4) III. Oriove

Lecture—3 hours; discussion—1 hour. Comparative survey of the interaction between diverse human cultural systems and the environment. Primary emphasis given to people in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Same course as Anthropology 133.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Anthropology 2.

(d) Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4) I. Powell

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies/Geology 116, Physics 9B, Mathematics 22C, Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geo-chemical cycles. (Same course as Geology 150A.)

150B. Geological Oceanography (3) II. McClain (Geology)

Lecture—3 hours. Prerequisite: Geology 50 or 116. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of sea-floor spreading theory. (Same course as Geology 150B.)

***150C. Biological Oceanography (3) III.** The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 1A and a course in general ecology, or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea and plankton communities. Existing knowledge and contemporary issues in research. Portion of course will be devoted to man's use of and impact on the ocean. (Same course as Geology 150C.)

151. Limnology (4) III. C. Goldman

Lecture—3 hours; discussion—1 hour; special project. Prerequisite: Biological Sciences 1A and junior standing. The biology and productivity of inland waters with emphasis on the physical and chemical environment.

151L. Limnology Laboratory (3) III. C. Goldman

Laboratory—6 hours; two weekend field trips. Prerequisite: course 151 (may be taken concurrently); junior, senior, or graduate standing. Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology.

(e) Environmental Policy Analysis

160. Environmental Decision Making (4) I. Sabatier
Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1; Economics 1A; introductory statistics; one course in environmental science. Alternative models of environmental policy-making, and application to case studies of decision-making in the U.S. and California.

161. Environmental Law (4) II. Wandesforde-Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and one course in environmental science (course 1, 10, 110, Biological Sciences 1A, Environmental Toxicology 10, or Resource Sciences 100); English 1 and Political Science 1 recommended. Introduction for non-Law School students to some of the principal issues in environmental law and the judicial interpretation of some important environmental statutes, e.g., NEPA. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: 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 Biology and Management 127. Introduction to major issues and evaluative techniques in the analysis of outdoor recreation policy. Principles of political science and economics are applied to the analysis of recreation demand and provision, and the resolution of conflicts between recreation and other uses.

163. Energy and Environmental Aspects of Transportation (3) II. Sperling

Lecture—3 hours. Prerequisite: Civil Engineering 160 recommended. Application of engineering, economic, and system planning concepts. Analysis of energy, air quality, and other selected environmental attributes of transportation technologies. Investigation of strategies for reducing pollution and petroleum consumption in light of institutional and political constraints. (Same course as Civil Engineering 163.)

164. Ethical Issues in Environmental Policy (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 preparation: 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 preparation: 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 alternate 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 multi-objective 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. The 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 alternate 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. The 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 alternate years.

178. Applied Research Methods (4) I. 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 1A; one course from the following: course 1, 10, 110, Environmental Toxicology 10, or Resource Sciences 100. Methods of analysis used in environmental impact reporting. Emphasis on effective writing; review and management of impact reports in the context of rational democratic planning systems.

(g) Other Courses

190. Workshops on Environmental Problems (1-8) I, II, III. The Staff

Laboratory—2-16 hours. Prerequisite: consent of instructor. Workshops featuring empirical analyses of contemporary environmental problems by multidisciplinary student teams. Guided by faculty and lay professionals, the teams seek to develop an integrated view of a problem and outline a series of alternative solutions. Open to all upper division and graduate students on application. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Department Chair person in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates

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

Graduate Courses

212A. Environmental Policy Analysis (4) III.

Sabatier

Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108), course in bureaucratic policy making (e.g. course 166 or Political Science 181) and course in intermediate statistics (e.g. Sociology 106 or Agricultural Economics 106). An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in alternate years. (Same course as Ecology 212A.)

212B. Environmental Policy Analysis: Evaluation (4) 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 alternate years. (Same course as Ecology 212B.)

***228. Advanced Simulation Modeling (3) III.** Foin
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 128-128L; Statistics 108 or Agricultural Economics 106. Advanced techniques in simulation modelling; optimization and simulation, dynamic parameter estimation, linear models, error propagation, and sensitivity testing. Latter half of course will introduce model evaluation in ecological and social system models.

***228L. Modeling Laboratory (3) III.** Foin
Laboratory—2 hours; modeling and computing—7 hours. Prerequisite: courses 128-128L; course 228 concurrently. Continuation of course 128L. Students expected to complete series of exercises on advanced topics in modeling and a term project based on their graduate research.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing. (S/U grading only.)

Environmental Toxicology

(College of Agricultural and Environmental Sciences)

Takayuki Shibamoto, Ph.D., Chairperson of the Department

Department Office, 4138 Meyer Hall (916-752-1142)

Faculty

Richard G. Burau, Ph.D., Professor (*Environmental Toxicology, Soil Science*)

Arthur L. Cragmill, Ph.D., Lecturer

Donald G. Crosby, Ph.D., Professor Emeritus

Bruce D. Hammock, Ph.D., Professor

(*Environmental Toxicology, Entomology*)

Dennis P. H. Hsleh, Sc.D., Professor

Theodore L. Hullar, Ph.D., Professor

Wendell W. Kilgore, Ph.D., Professor Emeritus

Fumio Matsumura, Ph.D., Professor

Marion G. Miller, Ph.D., Assistant Professor

Clayton A. Reece, M.S., Lecturer

Robert H. Rice, Ph.D., Associate Professor

James N. Seiber, Ph.D., Professor

Takayuki Shibamoto, Ph.D., Professor

Michael W. Stimmann, Ph.D., Lecturer

Berry W. Wilson, Ph.D., Professor (*Environmental*

Toxicology, Avian Sciences)

Wray W. Winterlin, M.S., Lecturer

Dorothy E. Woolley, Ph.D., Professor (*Environmental*

Toxicology, Animal Physiology)

The Major Program

Students in environmental toxicology study toxic substances which are found in our personal, occupational, community, and global environments. What these substances are, where they are distributed and what happens to them, how they work, and locating and analyzing these substances are the central focus of study.

The Program. The study of environmental toxicology draws heavily from preparatory courses in biology, chemistry, mathematics, and physics. The major offers courses outlining the chemical, biological, and legal aspects of environmental toxicology (legislation concerning pollution, pesticides, food additives, and consumer protection) as well as providing in-depth treatment of different groups of toxic substances. Students can specialize in any of several areas of environmental toxicology—for example chemical analysis, environmental monitoring, animal toxicology, or environmental health and safety—by choosing electives in these areas.

Internships and Career Alternatives. Research positions in both university and private laboratories, as well as with governmental regulatory agencies in nearby Sacramento, are examples of current internship openings for environmental toxicology majors. Approximately half of the undergraduates completing the environmental toxicology program elect to go on for advanced degrees in toxicology, pharmacology, public health, or the medical sciences. Others with the B.S. degree have found jobs with government agencies, universities, in industry, research and consulting firms, and with laboratories. Those students who emphasize the physical sciences in their study of toxicants would qualify for positions in residue analysis, environmental monitoring, and forensic toxicology. Those emphasizing the biological sciences would qualify for similar positions in animal toxicology, environmental health and safety, and pest control.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown

in parentheses where possible; equivalent or more comprehensive courses may be substituted with adviser's approval. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement.....0-8
See College requirement

Preparatory Subject Matter.....61-70

Biological sciences (Biological Sciences 1A, 1B, 1C).....15

Chemistry (Chemistry 1A-1B-1C, 5, or Chemistry 4A-4B-4C and 128A-128B-128C).....24-28

Computer science (Agricultural Science and Management 21).....3

Environmental sciences (Environmental Toxicology 10 or Environmental Studies 10).....3-4

Mathematics (Mathematics 16A-16B or 21A-21B).....6-8

Physics (Physics 1A-1B or 5A-5B).....6-8

Statistics (Statistics 13).....4

Breadth/General Education.....36

Satisfaction of the General Education requirement to include courses selected with adviser's approval to complement the major (courses in agricultural economics, environmental studies, political science, psychology, and sociology are particularly recommended.).....24

Additional breadth in humanities and social sciences.....12

Depth Subject Matter.....30

Biochemistry (Biochemistry 101A-101B).....7

Environmental Toxicology 101, 112A-112B, 114A-114B, 138 (128, 130A-E, 131, 132).....23

Restricted/Other Electives.....24

Electives selected for area of specialization with adviser's approval

Unrestricted Electives.....12-29

Total Units for the Degree.....180

Major Adviser. R.H. Rice

Advising Center for the major, is in 4111 Meyer Hall (916-752-1042).

Minor Program Requirements:

UNITS

Environmental Toxicology.....18

Environmental Toxicology 101, 112A, 114A, 138.....12

Elective courses 6 units minimum, selected from Environmental Toxicology 128, 198 and 199 (4 units combined maximum), 10, 130A-E, 131, 132, 190.....6

Minor Adviser. M.G. Miller.

Related Courses: See Atmospheric Science 149A, 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, Ecology, and Agricultural and Environmental Chemistry. For information on graduate study, contact the Advising Office or the appropriate graduate adviser. Refer also to the Graduate 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. The Staff
Lecture—3 hours. Prerequisite: open to science and non-science majors. Study of some natural and man-made toxic substances in personal, occupational,

community, and global environments. Emphasis placed upon occurrence, properties, and effects of toxic substances. Biological and physical factors which alter fate of substances are described.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Environmental Toxicology (3) I. Matsumura
Lecture—3 hours. Prerequisite: Chemistry 8B, 128B, or the equivalent; Biochemistry 101A recommended. The fate, consequences, and assessment of toxicants in environmental and biological systems; classes of environmental toxicants discussed include pesticides, air and water pollutants, phytotoxins, mycotoxins, food-borne toxicants, and heavy metals.

112A. Toxicants in the Environment (3) II. 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: Chemistry 5; course 112A; consent of instructor. Continuation of 112A. Toxic chemicals—primarily pollutants—in the environment; concepts and techniques of sampling, detecting, and measuring toxicants of current concern; collection, interpretation, and use of analytical data. Limited enrollment. Environmental Toxicology majors will be given preference for enrollment.

114A. Biological Effects of Toxicants (3) II. Rice
Lecture—3 hours. Prerequisite: 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 toxins, types of effects, symptoms, and antidotes.

114B. Biological Effects of Toxicants: Comparative Aspects (4) III. 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, toxic substances in food, 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; 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. The Staff
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.)

190C. Research Group Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference of advanced research methods and the interpretation of research results. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

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 alternate years.

214. Mechanisms of Toxic Action (3) III. Hammock, Matsumura, 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. Reece, Shibamoto
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 220 and Chemistry 129C; or consent of instructor. Application of GC/MS techniques to investigate toxic chemicals. Mass spectral fragmentations and their application to the structural elucidation. Practical application of GC/MS in current research. Preference given to environmental toxicology graduate students.

234. Neurophysiological Basis of Neurotoxicology (3) I. Woolley
Lecture—3 hours. Prerequisite: Physiology 110 or the equivalent; basic understanding of neurophysiology. Mechanisms of action at the cellular and systemic level of a number of different neurotoxins and toxicants. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Same course as Physiology 234.)

240. Ecotoxicology (3) III. Crosby
Lecture—3 hours. Prerequisite: elementary course in toxicology and ecology or the equivalent, or consent of instructor. Principles of toxicology as applied to chemical action on natural populations, communities, and ecosystems. Physical, chemical, and biological characteristics which influence ecotoxic effects, modelling, and field research. Selected case histories are analyzed and presented in class.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—1 hour. Prerequisite: consent of instructor. Presentation and critical discussion of advanced research methods and interpretation of research results. Designed primarily for graduate students. (S/U grading only.)

297T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon course being tutored. Prerequisite: graduate standing in Environmental Toxicology, a related major, or the equivalent experience, and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Epidemiology and Preventive Medicine

(School of Veterinary Medicine)

Richard H. McCapes, D.V.M., Chairperson of the Department

Department Office, 112 Surge-IV
(916-752-1376/9174)

Faculty

Raymond A. Bankowski, D.V.M., Ph.D., Professor Emeritus
 JoAnne Boorkman, M.S.L.S., Lecturer
 Tim E. Carpenter, Ph.D., Associate Professor
 James T. Case, D.V.M., Ph.D., Assistant Professor of Clinical Diagnostic Medicine
 Bruno B. Chomel, D.V.M., Ph.D., Assistant Professor
 Thomas B. Farver, Ph.D., 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
 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
 Philip H. Kass, D.V.M., Ph.D., Assistant Professor
 Carolyn S. Kopper, M.L.S., Lecturer
 Kenneth M. Lam, Ph.D., Associate Professor
 Richard H. McCapes, D.V.M., Senior Lecturer
 Duncan McMartin, D.V.M., Ph.D., 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 Emeritus
 Walter W. Sadler, D.V.M., M.P.H., Professor Emeritus
 Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor Emeritus
 Patton L. Smith, D.V.M., M.P.V.M., Lecturer
 Fredrick Stevens, D.V.M., M.S., Lecturer
 Mark C. Thurmond, D.V.M., Ph.D., Professor
 Patricia S. Wakenell, D.V.M., Ph.D., Assistant Professor
 George B. E. West, D.V.M., M.P.V.M., Lecturer
 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

Courses in Epidemiology and Preventive Medicine**Upper Division Courses****104. History of Veterinary Medicine (3) III.**

Lecture—2 hours; discussion—1 hour. Veterinary medicine's role (from man's first domestication of animals to the decline of Rome) in building a foundation for rational healing; and its contributions during the eighteenth-twentieth centuries to the creation of modern medicine.

106. Human-Animal Interactions: Benefits and Issues (2) II. Hart

Lecture—2 hours. Prerequisite: upper division standing or consent of instructor. The contributions of animals to human society, including historic, anthropologic, developmental, human health, and therapeutic perspectives, as well as effects of humans on animals.

111. Animal Hygiene (3) II. McCapes

Lecture—3 hours. Prerequisite: Biological Sciences 1A or consent of instructor. Causes, prevention, and control of animal diseases important in economic agriculture and in public health, with emphasis upon animal management factors in disease.

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. A thorough coverage of simple random sampling, stratified sampling,

cluster sampling, systematic sampling, and sequential sampling. Emphasis is on application of the sampling methods. Offered in alternate years.

203. Multivariate Biostatistics (3) I. Farver
 Lecture—3 hours. Prerequisite: courses 403 and 404, or the equivalent; consent of instructor. Multivariate procedures covered are principal component analysis, factor analysis, Two-group and k-group multivariate ANOVA, multivariate regression, Two-group and k-group discriminant analysis and repeated measures analysis, cluster analysis, and canonical analysis. Emphasis is on application of procedures. Offered in alternate years.

212. Epidemiology of the Zoonoses (3) II. Chomel
 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. 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. 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. Gardner
 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 alternate years.

219. Mycoplasma as Agents of Disease (2) III. Lam
 Lecture—2 hours. Prerequisite: Veterinary Microbiology and Immunology 127 or the equivalent or consent of instructor. Offered in alternate years.

220. Advanced Avian Medicine (3) III. Lam, Wakenell

Lecture—3 hours. Instruction on the methods of prevention of the major diseases of domestic poultry.

222. Epidemiological Modeling (3) II. Carpenter
 Lecture—1 hour; discussion—1 hour; laboratory—3 hour. Prerequisite: course 405. Techniques of model-building and simulation of infectious diseases will be explored. Epidemiologic 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.
 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.

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 dis-

eases 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: course 150 or consent of instructor. Study of the influence of techniques and procedures for processing meats and meat products upon their wholesomeness as food.

255. Animal Health Economics (3) III. Carpenter
 Lecture—3 hours. Prerequisite: consent of instructor. Basic concepts of microeconomics (production and cost functions, firm decision making, and the market place) as they relate to animal health are considered. Application of economic decision making techniques which may be used in veterinary medicine are also presented.

290. Current Topics in Avian Medicine (1) I, II, III. Lam, Wakenell

Seminar—1 hour. Prerequisite: consent of instructor. Topics from the current literature in avian medicine will be assigned to students for discussion and interpretation.

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 total. Prerequisite: enrollment in MPVM degree program. Introduction and overview to the concepts basic to biostatistics and epidemiology. (S/U grading only.)

401. Biomedical Information Resources and Retrieval (3) I. Boorkman

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: enrollment in MPVM Program or consent of instructor. Introduction to the skills and tools needed to find information in the biomedical sciences with an emphasis on veterinary medicine. Emphasis will be placed on selection of appropriate sources to solve a particular information need using both print and electronic reference and bibliographic sources.

402. Medical Statistics I (4) I, III.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: Fall quarter: course 400 or Statistics 13 (or the equivalent), and consent of instructor; Spring quarter: consent of instructor; restricted to students entering the DVM/MPVM dual degree program. Use of statistics in clinical, laboratory, and population medicine; graphical and tabular presentation; probability; binomial, normal, t-, F-, and Chi-square distributions; elementary nonparametric methods; introductory methods in regression and correlation; lifetables.

403. Medical Statistics II (4) II.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: course 402. Continuation of course 402. Analysis of variance in biomedical sciences; non-parametric methods; multiple regression; biomedical applications of statistical methods.

404. Medical Statistics III (4) III.

Lecture—3 hours; laboratory/discussion—2 hours. Prerequisite: course 403. Continuation of course 403. Analysis of covariance, variable selection; analysis of multiway frequency tables; logistic regression; discriminant analysis; time dependent variation and trends; biomedical applications.

405. Principles of Epidemiology (5) I. Hird

Lecture—3 hours; discussion—3 hours. Prerequisite: a degree in veterinary medicine, medicine, or dentistry, or consent of instructor. Approved for graduate degree credit. Combination of lectures, class discussions, and problem solving. Topics are methods of

investigating disease outbreaks, quantitating disease in populations, medical ecology survey methods, an introduction to epidemiologic study design and animal disease surveillance.

406. Epidemiologic Study Design (3) II. Hird
Lecture—2 hour; laboratory/discussion—3 hours. Prerequisite: course 405 or the equivalent; course 403 or the equivalent (may be taken concurrently). Approved for graduate degree credit. Design and interpretation of clinical trials, case-control, and cohort studies. Critical review of published epidemiologic studies. Principles of association and causality.

407. Analytical Epidemiology (3) III. Kass
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 406 and 404 (may be taken concurrently). Approved for graduate degree credit. Uses of multiple regression, discriminant analysis, factor analysis, path analysis and other multivariate techniques in epidemiology. Approaches for handling the analysis of large data sets.

408. Research Methodology and Research Reports (3) I.
Lecture—1 hour; discussion—2 hours. Prerequisites: enrolled in MPVM degree program or consent of instructor. Approved for graduate degree credit. Application of the experimental method to solving specific epidemiological field problems involving disease of animals. Students must identify and select a problem, and complete all work preparatory to the actual field collection of data or specimens.

409A-409B. Topics in Data Analysis (2-3) II-III. The Staff (Chairperson in charge)
Discussion—2 hours (409A); discussion—3 hours (409B). Prerequisite: course 406 (may be taken concurrently) or consent of instructor. Approved for graduate degree credit. Emphasis on decision making with respect to the type and amount of data required for solving epidemiological problems and the selection and use of appropriate data in statistics and economics for processing, analyzing, and interpreting these data. (Deferred grading only, pending completion of course.)

410A-410B. Topics in Applied Epidemiology (3-2) II-III. The Staff (Chairperson in charge)
Discussion—3 hours (410A); discussion—2 hours (410B). Prerequisite: course 406 (may be taken concurrently) or consent of instructor. Approved for graduate degree credit. Collection of data, and/or specimens from field studies, serum banks or data banks. Laboratory examination of specimens and recording of results. Alternative approaches to presentation of data and conclusions and formulations of recommendation for further investigations. (Deferred grading only, pending completion of course.)

411. Disease Control and Eradication (3) III. Riemann
Lecture—1.5 hours; discussion—1.5 hours. Prerequisite: Veterinary Medicine 409 or course 405. Studies of various approaches to control/eradicate diseases in animal populations. Design and economic evaluation of control programs.

412A. Use of Microcomputers: Level 1 (3) I. Stevens
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Introduction to and development of skills on modern microcomputers for students involved in epidemiological studies and research. Level one topics include microcomputer anatomy, operating systems, file handling, fundamentals of word processing, spreadsheets, and statistical analysis software.

412B. Use of Microcomputers: Level 2 (3) II. Stevens
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 412A or consent of instructor. Development of intermediate skills on modern microcomputers for students involved in epidemiological studies and research. Level two topics include advanced use of word processing and spreadsheet software, and introduction to database management programs.

412C. Use of Microcomputers: Level 3 (3) III. Stevens
Lecture—1 hour; laboratory—4 hours. Prerequisite:

course 412B or consent of instructor. Development of advanced skills on modern microcomputers for students involved in epidemiological studies and research. Level three topics include advanced use of database management programs, and development of application programs to facilitate the students' research efforts.

Family Practice

See Medicine, School of

Feminist Theory and Research

Judith Newton, Ph.D., Program Director
Program Office, 307 Young Hall (916-752-4686)

Graduate Study. The program in Women's Studies offers courses leading to a doctoral degree with a designated emphasis in Feminist Theory and Research. The courses provide theoretical and interdisciplinary perspectives to students already preparing for the Ph.D. in one of four participating departments (Anthropology, English, History, and Sociology; other departments are in the process of joining). Students complete all requirements for the Ph.D., including the dissertation, in one of the participating departments. The additional requirements leading to the designated emphasis consist of two core courses (Women's Studies 200A and 200B) and two additional graduate courses, one of which must be in the student's home department. It is expected that an analysis of gender will be a central component of the student's doctoral examination and dissertation.

Graduate Adviser. Consult the Women's Studies office (916-752-4686).

Fermentation Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Fermentation Science major is a program of study of the fundamental and applied sciences related to the use of microorganisms as production and processing agents. A broad interdisciplinary food-related education is offered which may be combined with specializations in enology (wine studies), brewing science, and fermentation of other foods and beverages. Industrial fermentations and waste treatments in the production of microbial cells, drugs, enzymes, hormones, solvents, acids, and vitamins are further opportunities for study.

The Program. The major in fermentation science leads to a Bachelor of Science degree. Most of the instruction for the major is done in the Department of Viticulture and Enology and in the Department of Food Science and Technology. Students also take courses in chemistry, biochemistry, microbiology, genetics, and computer science. Electives often include additional courses in sensory science, management and viticulture.

Career Alternatives. Graduates qualify for supervisory, technical, production, product development, quality control, research, sales, or executive positions in the food, beverage, and allied industries, in the fermentation industries, and in governmental agencies. Students who choose to continue in graduate study have done so in such areas as food science-enology, microbiology, agricultural chemistry, and biochemistry.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirement are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted.)

UNITS

English Composition Requirement0-8
See College requirement

Preparatory Subject Matter59-66

Biochemistry (Biochemistry 101A, 101B) ..6

Biology (Biological Sciences 1A)5

Chemistry (Chemistry 1A-1B-1C, 5, and 8A-8B; or 4A-4B-4C and 128A-128B, 129A).....21-25

Computer science (Agricultural Science and Management 21, Computer Science Engineering 10, 30, or Engineering 5)3-4

Mathematics (Mathematics 16A-16B or 21A-21B).....6-8

Microbiology (Microbiology 102-102L)6

Physics (Physics 5A, 5C)8

Statistics, including analysis of variance (Agricultural Science and Management 150 or Statistics 106)4

Breadth/General Education24

Satisfaction of General Education requirement (in "Civilization and Culture" and/or "Contemporary Societies") plus additional course work in social sciences and humanities or others as approved by adviser to total 24 units.

Depth Subject Matter40

Choose from:
Chemistry 107A, 107B, 130
Chemical Engineering 161, 206
Epidemiology and Preventive Medicine 150 (or Food Science and Technology 104)

Food Science and Technology 102, 102L, 104, 104L, 108, 109, 110A, 110B, 128, 150, 150L, 205, 235, 250, 250L
Genetics 100

Microbiology 105, 130A, 130B, 130L
Viticulture and Enology 3, 123, 124, 125, 126, 127, 135, 140, 186, 217, 219 235 (no variable-unit 190, 192, 199, 299 courses allowed toward depth requirement)

(Courses in depth subject matter may not be taken on the P/NP grading basis. Overall GPA in depth subject matter must be 2.0 or greater)

Restricted Electives26

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.

Unrestricted Electives14-22

Total Units for the Degree180

Major Adviser. A.C. Noble.

Graduate Study. Refer to the Graduate Division degree programs in Agricultural and Environmental Chemistry, Biochemistry, Chemical Engineering, Food Science, Genetics, Microbiology.

Fiber and Polymer Science

(College of Agricultural and Environmental Sciences)

Faculty

See Textiles and Clothing

The Major Program

The fiber and polymer science major is concerned with the physical, chemical, and structural properties of fibers and polymers and how these relate to fiber and polymer performance and end-use.

The Program. All students in this major are required to take a common core of course work in chemistry, physics, and mathematics, and depth subject matter in fiber and polymer science, organic and physical chemistry, and technical writing. In the restricted electives, the student is expected to select from courses from areas such as computer science and mathematics, chemistry, marketing and management, material and advanced fiber and polymer science, and textiles.

Career Alternatives. The major prepares the student for a career in a wide range of industries in the areas of research and development, technical marketing and management, production, quality control, and science teaching (on completion of an additional year in the teaching credential program). The companies employing Fiber and Polymer Science graduates are in the fiber, polymer, absorbent product, textile and/or chemical business. Graduates are prepared to enter the graduate program in textiles or agricultural and environmental chemistry with a specialization in fiber and polymer chemistry, and fiber and polymer science programs at other universities.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirement are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted.)

	UNITS
English Composition Requirement	7-12
See College requirement	0-8
Rhetoric 1	4
Additional English (English 104)	3
Preparatory Subject Matter	55-58
Chemistry (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 5A, 5B, 5C or 9A, 9B, 9C).....	12
Statistics (Statistics 13 or Agricultural Science and Management 150).....	4
Textiles and clothing (Textiles and Clothing 6 and 8 or Engineering 45).....	8
Breadth/General Education	6-24
Satisfaction of General Education requirement; See advising office for breadth requirement.	
Depth Subject Matter	37
Textiles Science: Textiles and Clothing 163, 163L, 180A, 180B,	8
Fiber and Polymer Science 100, 150, 161, 161L	10
Chemistry (Chemistry 128A, 128B, 128C, 129A, 129B, 110A and 110C or 107A and 107B)	19
Restricted Electives	30
Select courses from the following:	
<i>Computer Science and Mathematics:</i>	
Agricultural Science and Management 21; Engineering 5; Applied Science Engineering 115, 116; Food Science and Technology 156; Mathematics 22A, 22B	
<i>Chemistry:</i>	
Chemistry 108, 111, 115, 120, 121, 124A, 124B, 124C, 130, 131, 140	
<i>Marketing/Management:</i>	
Agricultural Economics 100A, 100B, 113, 136, 157, Economics 1A, 1B, Statistics 103	
<i>Material and Advanced Fiber/Polymer Science:</i>	
Aeronautical Science Engineering 137,	

Engineering 104A, 104B, Textiles and Clothing 250A-F, 290, 293

Textiles:

Textiles and Clothing 162, 162L, 164, 171, 173, 174, 220

Unrestricted Electives.....**24-41**
Total Units for the Degree.....**180**

Major Adviser. Y.L. Hsieh (*Textiles and Clothing*).

Advising Center for the major is located in 129 Everson Hall (916-752-4417).

Minor Program Requirements:

	UNITS
Fiber and Polymer Science	18
Textiles and Clothing 6 or Engineering 45	4
Courses selected from the following:	
Fiber and Polymer Science 100, 150, 161, 161L; and	
Textiles and Clothing 163 and 163L or 180A and 180B	14

Minor Adviser. Y.L. Hsieh

Courses in Fiber and Polymer Science

100. Principles of Polymer Materials Science (3) I. Zeronian

Lecture—3 hours. Prerequisite: Chemistry 1A-1B or 4A-4B Chemistry 8A-8B or Engineering 45; Introductory physics. The basic principles of polymer science are presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Engineering: Materials Science 147.)

110. Synthetic Fibers and Plastics in Society (3) I. 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 preparation: Chemistry 10 or introductory course in physical sciences.

150. Polymer Syntheses and Reactions (3) III. Hsieh

Lecture—3 hours. Prerequisite: Chemistry 128B or 8B, and Chemistry 107A. Organic and physical chemistry aspects of polymer syntheses and reactions including polymerization mechanisms, kinetics and thermodynamics for major types of organic high polymers.

161. Structure and Properties of Fibers (3) I. Zeronian

Lecture—3 hours. Prerequisite: Textiles and Clothing 6 and Chemistry 8B. The structure, properties and reactions of natural- and man-made fibers; the relations between molecular structure of fibers and their physical properties; interactions of fibers and detergents.

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.

Fisheries

See Animal Science; and Wildlife and Fisheries Biology

Food Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The major in food biochemistry stresses the principles of chemistry and biochemistry as related to constituents of foods and the changes which occur in the constituents before and during processing and during storage. Particular emphasis is placed on the role of and changes in the carbohydrates, lipids, proteins, enzymes, and nucleic acids and their affect on the quality attributes of foods.

The Program. The food biochemistry curriculum stresses a strong background in chemistry, physics, mathematics, and biology at the lower-division level. At the upper-division level students take specialized courses in food science and technology and advanced biochemistry and nutrition. Through the appropriate choice of electives, students may emphasize certain research areas such as nutrition, food processing, or toxicology.

Career Alternatives. The major employment options for a food biochemistry graduate are in research and development at large food industry units; in laboratory-related employment in quality assurance, new food technology, and food analysis; or in any position requiring knowledge of biochemical techniques, such as in clinical laboratories. The major offers excellent preparation for graduate study in areas such as food science, nutrition, biochemistry, and environmental toxicology. Food biochemistry has also been chosen as a pre-professional major by students interested in medical, veterinary, or dental school.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College English requirement	
Preparatory Subject Matter	73-81
Biochemistry (Biochemistry 101A, 101B) ..6	
Biology (Biological Sciences 1A).....	5
Chemistry (Chemistry 1A-1B-1C, 5 or 4A-4B-4C; 128A-128B-128C, 129A; 107A-107B or 110A-110B)	32-36
Mathematics (Mathematics 16A-16B-16C or 21A-21B-21C).....	9-12
Microbiology (Microbiology 102, 102L)	6
Physics (Physics 5A-5B-5C or 8A-8B-8C).....	12
Other (one course from Computer Science Engineering 10, 30, Engineering 5, Mathematics 22A, 22B, 22C, Statistics 13, Agricultural Science and Management 150	3-4
Breadth/General Education	24
Satisfaction of General Education requirement	24
Depth Subject Matter	30
Food Science and Technology (to include Food Science and Technology 103, 104, 104L, 110A or 111)	25
Biochemistry (Biochemistry 123, 123L)	5
Restricted Electives	24
At least one upper division biochemistry course, other than Biochemistry 101A, 101B, 101L. One nutrition course other than Nutrition 10. Remaining courses can be selected from biochemistry, physiology, environmental toxicology, genetics, public health, microbiology or other subjects related to Food Science	24
Unrestricted Electives	13-22
Total Units for the Degree	180

Major Adviser. G.M. Smith (*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.

The Program. Students studying for the Bachelor of Science degree in food science must complete courses in biology and microbiology, general chemistry, organic chemistry, quantitative analysis, and biochemistry. Calculus, statistics, and physics are also required. These subjects help students understand courses in food science such as food composition and properties, food processing and engineering, food microbiology, food chemistry, and nutrition. Students also take courses in English and/or rhetoric (emphasizing writing and communication skills), and broaden their general education by taking courses in social sciences and humanities. The requirements are flexible so students can elect several courses in a related area of interest.

Career Alternatives. 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. or Ph.D. degree in food science, or in related fields such as agricultural chemistry, biochemistry, microbiology, and nutrition.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	60-64
Biochemistry (Biochemistry 101A-101B) ...6	
Biological sciences (Biological Sciences 1A, 1B, 1C)	15
Chemistry (Chemistry 1A-1B-1C-5 or 4A-4B-4C; 8A-8B)	21-25
Mathematics (Mathematics 16A-16B)	6
Physics (Physics 5A-5B)	8
Statistics (Agricultural Science and Management 150 or Statistics 13)	4
Breadth/General Education	24
Satisfaction of General Education requirement plus social science and humanities electives to total 24 units	24
Depth Subject Matter	28
Food Science and Technology 100A, 100B, 101A, 101B, 103, 104, 104L, 110A, 110B, and 190	28
Restricted Electives	40
One course in nutrition, and other courses selected with approval of faculty adviser from two or three of the following cluster groupings: Nutrition & Toxicology, Chemistry & Biochemistry, Microbiology & Biotechnology, Analytical & Sensory Analysis, Processing &	

Engineering, Commodity Courses, and Business & Economics. (Master list of cluster courses available through department Advising Center.).....40

Unrestricted Electives

Total Units for the Degree.....180

Major Adviser. D.S. Reid (*Food Science and Technology*).

Graduate Study. A program of study and research leading to the M.S. and Ph.D. degrees in Food Science is available (see below). For further information on graduate study, contact the graduate adviser.

Food Science (A Graduate Group)

Charles F. Shoemaker, Ph.D., Chairperson of the Group

Group Office, 109 Food Science and Technology Bldg. (916-752-1415)

Faculty. Includes members from twelve departments in the Colleges of Agricultural and Environmental Sciences and Engineering, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The interdepartmental Graduate Group in Food Science offers programs of study leading to the M.S. degree and to the Ph.D. degree. Graduate studies stress the application of the biological, chemical, physical, and behavioral sciences to the processing, preservation, quality evaluation, public health aspects, and utilization of foods. For the M.S. degree there are five areas of specialization: chemistry-biochemistry, microbiology, engineering-technology, sensory sciences, and enology. Individually designed programs are also acceptable. For the Ph.D. there are three areas of specialization: biochemistry, chemistry, and microbiology. Detailed information regarding graduate study is available through the Group Chairperson or by obtaining the *Graduate Announcement*.

Graduate Advisers. Contact 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 (916-752-1465)

Faculty

Everett Bandman, Ph.D., Professor
 Ericka L. Barrett, Ph.D., Professor
 Richard A. Bernhard, Ph.D., Professor
 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., Associate 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 Emeritus
 John M. Krochta, Ph.D., Professor (*Food Science and Technology, Agricultural Engineering*)
 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 Emeritus

Kathryn L. McCarthy, Ph.D., Assistant Professor (*Food Science and Technology, Agricultural Engineering*)

Michael J. McCarthy, Ph.D., Assistant Professor (*Food Science and Technology, Agricultural Engineering*)

R. Larry Merson, Ph.D., Professor (*Food Science and Technology, Agricultural Engineering*)

Martin W. Miller, Ph.D., Professor Emeritus

David M. Ogrzydziak, Ph.D., Professor

Michael A. O'Mahony, Ph.D., 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 Emeritus

Gerald F. Russell, Ph.D., Professor

Barbara O. Schneeman, Ph.D., Professor (*Food Science and Technology, Internal Medicine, Nutrition*)

C.F. Shoemaker, Ph.D., Associate Professor

Elizabeth O. Shuster, Ph.D., Assistant Professor

R. Paul Singh, Ph.D., Professor (*Food Science and Technology, Agricultural Engineering*)

Gary M. Smith, Ph.D., Associate Professor

Lloyd M. Smith, Ph.D., Professor Emeritus

Clarence Sterling, Ph.D., Professor Emeritus

Aloys L. Tappel, Ph.D., Professor

John R. Whitaker, Ph.D., Professor

Gideon Zeldler, 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
 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
 Lecture—3 hours; one industrial visit to a food factory (optional). Processes by which raw agricultural commodities are preserved and converted into edible foods; regulation of food manufacture and the chemistry and microbiology of food that control its qualities and safety. Not open for credit to students who have received credit for any other Food Science and Technology course. General Education credit: Nature and Environment/Introductory.

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. 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-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. Mazellis

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. Malt and Brewing Science (4) I. Lewis

Lecture—4 hours. Prerequisite: Biochemistry 101B recommended. Technology of malting, brewing, fermentation, finishing, and packaging of beer is integrated with the chemistry, biochemistry, and microbiology that determine industrial practice and control product quality.

102L. Malt 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, 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 (4) III. C. Price, Shuster

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, course 104. Cultural and morphological characteristics of microorganisms involved in food spoilage, in food-borne disease, and food fermentation. Analysis of microbiological quality of foods.

107. Principles of Sensory Analysis of Foods (4) II.

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 Microbiology 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. Reid

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 5A and 5B or the equivalent; calculus recommended. Not open for credit to students enrolled in College of Engineering. Applications of the conservation of mass and energy to food processing. Elements of engineering thermodynamics, fluid mechanics, and problem solving.

110B. Heat and Mass Transfer in Food Processing (3) II. Singh

Lecture—3 hours. Prerequisite: course 110A or the equivalent; Agricultural Engineering Technology 110L recommended (may be taken concurrently). Rate processes: conduction, convection, and radiation heat transfer; microwave heating, refrigeration, freezing, psychrometrics; mass transfer during drying, and storage.

111. Introduction to Food Processing (4) II. M. McCarthy, Miller

Lecture—3 hours; discussion-demonstration—2 hours. Prerequisite: Microbiology 2, Chemistry 8A-8B, and Physics 5A, 5B, 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 1A; Statistics 13 or Agricultural Science and Management 150 (may be taken concurrently). Structure and function of sensory receptor systems; psychological and physiological variables affecting sensory responses. Critical examination of modern psychophysical methods for the investigation of the mechanisms of human sensory systems. Problems of sensory measurement and their relation to food flavor.

119. Chemistry and Technology of Milk and Dairy Products (4) III. 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, developmental and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology and public health issues associated with meat products. (Same course as Animal Science 120.)

120L. Meat Science Laboratory (2) III. Lee (Animal Science), Bandman

Discussion—1 hour; laboratory—3 hours. Prerequisite: 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. 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. Ogyrdziak, 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 alternate years.

125. Corrosion Principles in Food Processing Interactions (3) II. Gruenwedel

Lecture—3 hours. Prerequisite: Mathematics 16B; Physics 5C; Chemistry 8B. Course presents thermodynamic and kinetic principles of container-product interactions (internal corrosion) and investigates how these interactions affect the wholesomeness of processed, canned foods.

128. Food Toxicology (3) III. Gruenwedel, Shibamoto (Environmental Toxicology)

Lecture—3 hours. Prerequisite: 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. Krochta, Henderson, Zeldler

Lecture—3 hours. Prerequisite: course 1 or 111, Chemistry 8B, Microbiology 2 and Physics 5B, or consent of instructor. Technical aspects of packaging processed foods. Definitions and functions of packages for food. Packaging materials and properties. Public health problems associated with packaging. Food-packaging interactions for major commodities and their control.

140. Food Laws and Regulation (3) I. Loiseaux (Law)

Lecture—3 hours. Prerequisite: upper division standing. Legal and scientific issues involved in the regulation of the nation's food supply and nutritional status. Philosophy underpinning the application of regulatory statutes. Sources of information necessary for communication with government on public food policy information.

150. Thermal Processing of Foods (3) III. Merson

Lecture—2 hours; discussion, demonstration, and problem workshops—2 hours. Prerequisite: courses 104 and 110B or the equivalent. Theory and practical considerations of thermal processes by canning, pasteurization, and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Description and engineering analysis of thermal processing equipment.

150L. Thermal Processing Laboratory (2) III. Merson

Laboratory—6 hours. Prerequisite: courses 104 and 110B; course 150 (may be taken concurrently). Laboratory exercises and student participation in the use and application of thermal processing methods and related procedures, and the interpretation of results, including evaluation of can closures, operation of thermal processing equipment, and the development and testing of sterilization processes.

151. Freezing Preservation of Food (3) 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 alternate years.

156. Computer Interfacing for Laboratory and Process Control (4) II. Russell

Lecture—3 hours; laboratory—3 hours. Prerequisite: consent of instructors. Principles of micro- and mini-computer use in measurement and control of laboratory instrumentation and processing operations with both theoretical and practical aspects of computer interfacing.

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)
Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in the practical application of food science. (P/NP grading only.)

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. Tappe, 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 (4) II. Reid, Haard
Lecture—3 hours; term paper. 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.

203. Food Processing (3) III. K. McCarthy
Lecture—3 hours. Prerequisite: Physics 6C, Mathematics 16C, Chemistry 107B, undergraduate food processing course. Principles of food engineering applied to food processing. Relationship of Newtonian and non-Newtonian fluid properties to heat and momentum transfer. Application of mass transfer in controlling kinetics and quality changes of foods.

205. Industrial Microbiology (3) I. Ogyrdziak
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 alternate years.

207. Advanced Sensory-Instrumental Analyses (3) III. Noble (Viticulture and Enology)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107 and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced statistical analysis of relation of colorimetry, texturometry, and chemistry of volatile compounds to perception of appearance, texture, flavor. Offered in alternate years.

210. Proteins: Functional Activities and Interactions (3) II.
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. Lipids: Chemistry and Nutrition (3) I. German
Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 107B, 128B. Chemistry of lipids as it pertains to research in food and nutrition. Relations between lipid structure and their physical properties in tissues and foods. Regulation of absorption, transport, and metabolism of lipids. Implications of dietary fats and health.

235. Mycology of Food and Food Products (3) II. Miller

Lecture—3 hours. Prerequisite: course 104 or consent of instructor. Morphology and physiology of fungi associated with food. Desirable activities of fungi: food fermentations, single-cell protein production, mushroom culture. Undesirable activities: pre-harvest and postharvest deterioration, food spoilage and preservation, toxin production.

250. Chromatographic and Electrophoretic Methods (4) II. G. Smith, Bandman, German
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1A-1B-1C, 8A-8B, 107A-107B; 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, German
Laboratory—3 hours. Prerequisite: course 250 concurrently. Practice of gas and liquid chromatography and electrophoresis for analytical and preparative applications. Choice and optimization of separation methods, detection systems, and recovery of purified sample components.

256. Computer Applications in Laboratory and Process Control (3) III. Russell
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 156 or the equivalent. Theory and practice of microcomputer interfacing to laboratory instrumentation for analytical and process control applications. Study of methods common to modern instrumentation and control systems including: A/D and D/A conversions, transducers, signal conditioning, and data transmission.

290. Seminar (1) I, II. Price
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. Price
Seminar—1 hour. Prerequisite: completion of at least one quarter of course 290. Oral presentation of student's original research, discussion, and critical evaluation. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (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.

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 Meyer Hall (916-752-2512).

Upper Division Courses

120. Principles of Quantity Food Production (3) III. Prophet

Lecture—3 hours. Prerequisite: Food Science and Technology 100B and 101BL. Fundamental principles of food service management including quantity food preparation, institutional equipment, receiving and storage, service, menu planning, merchandising, and safety.

120L. Quantity Food Production Laboratory (2) I, II. Prophet
Laboratory—6 hours. Prerequisite: course 120. Laboratory experience in quantity food production and service.

121. Institutional Food Purchasing and Sanitation (3) I. 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
Lecture—3 hours. Prerequisite: a basic course in general psychology. Major personnel management functions; legal constraints and requirements; procedures in solving personnel problems faced by supervisors.

192. Internship (1-12) I, II, III. The Staff
Internship—3-36 hours. Prerequisite: one upper division course in Food Service Management and consent of instructor. Work experience on or off campus in practical aspects of food service management, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Food Service Management (1-2) I, II, III. The Staff (Prophet in charge)

Discussion/laboratory—3 or 6 hours. Prerequisite: Dietetics or related major; completion of the Food Service Management course in which tutoring is done. Tutoring of students in food service management, assistance with discussion groups or laboratory sections; weekly conference with instructor in charge of course; written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Prophet in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Prophet in charge)

French

(College of Letters and Science)

Manfred Kusch, Ph.D., Chairperson of the Department

Department Office (French and Italian), 516 Sproul Hall (916-752-0830)

Faculty

Claude Abraham, Ph.D., Professor
Emily Apter, Ph.D., Associate Professor
Max Bach, Ph.D., Professor Emeritus

Marc E. Blanchard, Agrégé de Lettres, Professor
(*French, Critical Theory*)
Edward M. Bloomberg, Ph.D., Associate Professor
Ruby Cohn, Ph.D., Professor (*Comparative Literature, Dramatic Art*)
Michele Hannoosh, Ph.D., Assistant Professor
(*French, Comparative Literature*)
Gerald Herman, Ph.D., Senior Lecturer
Margo R. Kaufman, M.A., Senior Lecturer
Manfred Kusch, Ph.D., Associate Professor (*French, Comparative Literature*)
Marshall Lindsay, Ph.D., Professor Emeritus
Maria I. Manea-Manoliu, Ph.D., Professor
Michèle Praeger, Ph.D., Assistant Professor
Georges van den Abeele, Ph.D., Associate Professor
Ruth B. York, Ph.D., Senior Lecturer Emerita

The Major Program

The major program is designed to assure proficiency in all four of the language skills—speaking, understanding, reading, and writing—and to acquaint students with the intellectual and cultural contributions of the French-speaking world through the study of its literature, traditions, and institutions.

The Program. The department is strongly committed to undergraduate education. It encourages its students to work closely with the academic adviser in designing a major tailored to their needs and interests within the broad requirements prescribed by the program and to avail themselves of the guidance of an excellent teaching faculty. The department sponsors an active French Club and a chapter of Pi Delta Phi, the National French Honor Society. Each year, a substantial number of students with a good preparation in French participate in the university's very popular Education Abroad Program which maintains centers at seven French universities.

Career Alternatives. Foreign language teachers, a cardiologist, a veterinarian, a naval commander at the Pentagon, a professor of Political Science, lawyers, sales representatives, journalists, an anesthesiologist, a law professor, translators, a senior applications programmer, travel agents, independent business owners, a senior museum preparator, nurses, financial managers, stock brokers, and an industrial attaché for a French Trade Commission, all graduated with an A.B. in French from UC Davis and represent only a small fraction of the career choices documented in a recent survey of department graduates.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	19-36
French 1, 2, 3, 5 (or the equivalent)	0-17
French 21, 22, 23	15
Linguistics 1	4
French 45 recommended.	
Depth Subject Matter	44
French 100	4
French 101, 102, 103	12
French 104	4
Two additional upper division French literature courses	8
Elective courses in French literature, language, or civilization to be chosen in consultation with undergraduate adviser	16
Total Units for the Major	63-80

Recommended

French 101, 102, 103, 104, 107, 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

Two elective courses in French language, literature, or civilization to be chosen in consultation with undergraduate adviser

Prerequisite Credit. Credit will not normally be given for a course if it is the prerequisite of a course already successfully completed. Exceptions can be made by the Department Chairperson only.

Honors Program. Candidates for high or highest honors in French must write a senior thesis under the direction of a faculty member. For this purpose, honors candidates must enroll in at least six units of French 194H distributed over two quarters. Normally, a student will undertake the honors project during the first two quarters of the senior year; other arrangements must be authorized by the department chair. Only students who, at the end of the junior year (135 units), have attained a cumulative grade-point average of 3.5 in courses required for the major will be eligible for the honors program. The requirements for earning high and highest honors in French are in addition to the regular requirements for the major in French.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French.

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., Ph.D. degrees—French Linguistics); M. E. Blanchard (M.A., Ph.D. degrees—French Literature).

Teaching Credential Subject Representative. J. Wagnild. See also under the Teacher Education Program.

Courses in French

Students offering high school language preparation as a prerequisite must take a placement test.

Course Placement. Students with two years of high school French normally take French 2, those with three years take French 3 and those with four years take French 21.

Lower Division Courses

1. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Students who have successfully completed French 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

1G. French for Graduate Students (5) III. The Staff (Chairperson in charge)
Lecture-discussion—5 hours. A course designed to prepare students for the graduate reading examination in French. (P/NP grading only.)

2. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1.

3. Elementary French (5) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Continuation of course 2.

5. Introduction to French Phonetics (2) I, III. The Staff
Lecture/laboratory—3 hours. Prerequisite: course 3; course 5 is normally taken concurrently with course 21. Practically oriented presentation of French sounds and intonational patterns. Laboratory drills with emphasis on phonetic features specific to contemporary spoken French.

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.

21. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 3. Grammar, oral practice, composition. Initiation to French institutions; reading and discussion of short literary texts.

22. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 21. Continuation of course 21. Grammar, oral practice, composition. Contemporary French culture; reading and discussion of a play.

23. Intermediate French (5) I, II, III. The Staff
Lecture/discussion—5 hours. Prerequisite: course 22. Continuation of course 22. Grammar, oral practice, composition. Current topics in French politics and culture; reading and discussion of a novel.

25. Introduction to French Literature in Translation (3) II. The Staff
Discussion—3 hours. Introductory study of outstanding works of French drama and prose. Topics include major authors, genres, literary periods/movements. Study of literary techniques, structure, and meaning to foster better understanding of creative processes in French cultural context. Intended for the nonmajor. General Education credit: Civilization and Culture/Introductory.

35. Explication and Dissertation (2) III. The Staff (Chairperson in charge)
Lecture-discussion—2 hours. Prerequisite: course 22. Theory and practice of French *explication de texte* and *dissertation*. Especially recommended for those students planning to study abroad in French universities.

38. Intermediate French Conversation (2) I, II, III. The Staff
Discussion—2 hours; laboratory—1 hour. Prerequisite: course 22. 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, II, III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 22. Selected themes in French literature.

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; term paper. Prerequisite: course 23. Instruction and practice in expository writing in French, with emphasis on organization, correct syntax, and vocabulary building.

101. Introduction to French Poetry (4) I, II, III. The Staff
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing the main types of French poetry. Study of French poetic conventions and versification.

102. Introduction to French Drama (4) I, II, III. Abraham

*Course not offered this academic year.

Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of plays representing the main types of French drama, with emphasis on dramatic structure and techniques.

103. Introduction to French Prose (4) I, II, III. The Staff
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing main types of French prose, with emphasis on narrative structure and techniques.

104. Translation (4) I, II. The Staff
Lecture—3 hours; short translations. 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. 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 23 or consent of instructor. Advanced conversational practice stressing accurate pronunciation and spoken language fluency. Not open to native speakers. May not be counted toward French major. May be repeated once for credit.

110. Stylistics and Creative Composition (4) II. Herman
Lecture—3 hours; frequent papers. Prerequisite: course 100 or consent of instructor. Intensive course in creative composition using a variety of techniques and literary styles, patterned on Queneau's *Exercices de style*. Practice in such stylistic modifications as inversion, antithesis, changes in tense, mood, tonality, etc. The writing of poetry.

112. Masterpieces of French Drama in Translation (3) II. The Staff
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. Plays in translation representing the main types of French drama with emphasis on dramatic structure and techniques. Consideration of this genre within French social and cultural context. Intended for the nonmajor. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: 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 preparation: 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 preparation: French 25.

116. Literature of the Sixteenth Century (4) III. The Staff

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.

***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.

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.

***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.

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.

***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.

119A. The Nineteenth Century (4) II. Apter, Hannooch
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.

119B. The Nineteenth Century (4) III. Apter, Hannooch
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.** Apter, Hannooch
Lecture—3 hours; term paper. Prerequisite: courses 100 and 101 or consent of instructor. Poetry from the Pre-Romantics to Baudelaire.

120A. Twentieth-Century Drama (4) I. The Staff
Lecture—3 hours; term paper. Prerequisite: courses 100 and 102 or consent of instructor. Representative plays from Jarry to Giraudoux.

120B. Twentieth-Century Drama (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: courses 100 and 102 or consent of instructor. Representative plays from Anouilh to Arrabal.

***121. Twentieth-Century Novel (4) I.** Blanchard
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. *Soties, récits*, and novel of André Gide and novels of Marcel Proust.

***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.

***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, Breton, Aragon, Reverdy, Eluard, Desnos, Ponge, Char, Michaux, Bonnefoy.

***135. Advanced Composition (4) III.** Praeger
Lecture—3 hours; short papers. Prerequisite: course 100 or consent of instructor. Practice in advanced composition, using the French *dissertation* as model, with occasional *explications de texte*.

136. 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
Lecture—3 hours; term paper. Prerequisite: course 100 and course 101, 102, or 103 as appropriate to selected topic, or consent of instructor. Concentrated study of works of a single author. May be repeated once for credit as author-subject changes.

***141. Selected Topics in French Literature (4) II.** The Staff
Lecture—3 hours; term paper or short papers. Prerequisite: courses 100 and 101 or 102 or 103 as appropriate to the selected topic or consent of instructor. Subjects and themes such as satiric and didactic poetry of the Middle Ages, poetry of the Pléiade, theater in the eighteenth century, pre-romantic poetry, etc. May be repeated once for credit in a different subject area.

160. Structure of the French Language (4) II. Manea-Manoliu
Lecture—3 hours; short papers. Prerequisite: course 23; Linguistics 1. Analysis of content and functions of the main grammatical categories of French in framework of recent structural approaches.

161. Modern French Syntax (4) III. Manea-Manoliu
Lecture—3 hours; short papers. Prerequisite: course 160. Presentation of basic concepts of contemporary approaches to French syntax. Consideration of new explanations of so-called "irregular" phenomena in current language models.

***162. History of French Language (4) II.** Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: course 160. Main periods in development of the French language, from Latin to contemporary popular aspects, with emphasis on relationship between socio-cultural patterns and evolution of the language.

192. Internship (1-12) I, II, III. The Staff
Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Practical application of the French language through work experience in government and/or business, culminating in an analytical term paper on a topic approved by the sponsoring instructor. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)
Independent study—1-5 hours. Prerequisite: open only to French majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member, leading to a senior honors thesis on a topic in French literature, civilization, or language studies. (P/NP grading only.)

197T. Tutoring in French (1-4) I, II, III. The Staff
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

***197TC. Tutoring in the Community (2-4) I, II, III.** Kaufman
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Literary Analysis (2) I. Blanchard
Proseminar—1 1/2 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 phonematic and grammatical structures of French, from Latin to contemporary spoken aspects.

***205A. Sixteenth-Century Literature: The Humanists (4) I.** The Staff

Seminar—3 hours. French humanism in its most varied forms. Although at different times Rabelais and Montaigne will be primarily studied, other leading intellectuals and religious writers will also receive attention. May be repeated for credit when different topic is studied.

206A. Seventeenth-Century Literature: Theater (4) II. Abraham

Seminar—3 hours. Works of Corneille, Racine, Molière, and minor dramatists. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied.

***206B. Seventeenth-Century Literature: Prose (4) I.** The Staff

Seminar—3 hours; term paper and/or exposé. Works of authors such as Pascal, Descartes, Mme de Lafayette. One or more authors may be covered. May be repeated for credit with consent of instructor as different topics are studied from quarter to quarter.

***206C. Seventeenth-Century Literature: Poetry (4) III.** Abraham

Seminar—3 hours; term paper and/or exposé. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor.

***207A. Eighteenth-Century Literature: Philosophes (4) II.** Kusch

Seminar—3 hours; term paper and/or exposé. Not a course in philosophy, but an examination of the role of philosophy in the design and context of literary works. Study of one or more authors. May be repeated for credit.

207B. Eighteenth-Century Literature: Novel (4) III. The Staff

Seminar—3 hours. Rise of the novel. Study of narrative experiments in the context of the philosophical climate and new literary values. Course may treat one or more novelists of the period. May be repeated for credit when different topics are studied.

208A. Nineteenth-Century Literature: Fiction (4) I. Hannoosh

Seminar—3 hours. Study of the works of one or several novelists and/or short-story writers of the period. May be repeated for credit with consent of instructor when different topics are studied.

208B. Nineteenth-Century Literature: Poetry (4) III. Blanchard

Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied.

209A. Twentieth-Century: Prose (4) II. The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several writers of the period.

***209B. Twentieth-Century: Theater (4) II.** 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.

***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 subjectivization, passivization, relativization, etc.) focusing on the most recent developments in the field (i.e., case grammars, generative semantics, trace theory, etc.).

***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.

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. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

390B. The Teaching of French In College (2) II. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

390C. The Teaching of French In College (2) III. Wagnild

Lecture/discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

Freshman Seminar Program

Evelyn M. Silvia, Ph.D., Program Director
Program Office, 17 Wellman (Teaching Resources Center) (916-752-6050)

Committee in Charge

Stephanie Beardsley, Ph.D. (Residence Life)
Kevin DeBrose (Student Representative, ASUCD—Academic Affairs)
Louis Grivetti, Ph.D. (Previous FRS Instructor)
Karl Romstad, Ph.D. (College of Engineering)
David Robertson, Ph.D. (Committee on Educational Policy)
Roger Romani, Ph.D. (College of Agricultural and Environmental Sciences)
Carolyn Wall, Ph.D. (College of Letters and Science)
Dennis Holden, 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 40 quarter units. Investigation of a special topic through shared readings, discussions, written assignments, and special activities (such as field-work, 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 (916-752-0200)

Faculty

James B. Boyd, Ph.D., Professor
Kenneth Burtis, Ph.D., Assistant Professor
Gordon J. Edlin, Ph.D., Professor Emeritus
John H. Gillespie, Ph.D., Professor
Leslie D. Gottlieb, Ph.D., Professor
Melvin M. Green, Ph.D., Professor Emeritus
R. Scott Hawley, Ph.D., Professor
John A. Kiger, Jr., Ph.D., Professor
Charles H. Langley, Ph.D., Professor
Timothy Prout, Ph.D., Professor Emeritus (*Genetics, Entomology*)
Raymond L. Rodriguez, Ph.D., Professor
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.

The Program. Genetics majors begin with a core of introductory courses in biological sciences, chemistry, mathematics, statistics, and other basic sciences. At the upper division level they have an opportunity to specialize in areas such as molecular, developmental, population, and evolutionary genetics.

Choice of College. Students may elect this major either in the College of Agricultural and Environmental Sciences or in the College of Letters and Science. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

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. 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 Mark Hall.

Career Alternatives. The genetics degree provides suitable preparation for a wide variety of careers, including teaching, research, work with biotechnology companies, medicine, and all the health sciences. It is also an excellent background for students wishing to enter a graduate program, a teacher-training program, medical school, veterinary school, or other professional schools.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	64-73
Biological sciences (Biological Sciences 1A, 1B, 1C, Biological Sciences 1 may replace 1A; Zoology 2-2L may replace 1B; Botany 2 may replace 1C).....	14-16
Chemistry (Chemistry 1A-1B-1C or 4A-4B-4C; 8A-8B, 118A-118B-118C, or 126A-126B-126C; 118A-118B-118C recommended).....	21-24
Mathematics (Mathematics 16A-16B-16C or 21A-21B-21C).....	9-12
Microbiology (Microbiology 102 or 2 (102 recommended); 3).....	4-5
Physics (Physics 6A-6B-6C).....	12
Statistics (Statistics 13 or 102 (102 recommended)).....	4
Breadth/General Education	28
<i>College of Agricultural and Environmental Sciences students:</i>	
Satisfaction of General Education requirement plus social science and/or humanities electives to total 28 units†	
<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.	
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 102L, 104, 107; and one course from Genetics 103, 105, 106.	
Restricted Electives	18-30
A minimum of 18 units of course credit	

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

chosen from upper division courses in biological sciences, mathematics, chemistry, or other fields relevant to the student's interest chosen in consultation with the adviser. At least two different areas are to be represented, such as agricultural sciences, biochemistry, cell biology, statistics, physiology, or systematics. No more than 6 units of 192, 198, 199 or laboratory credit can be used in this category.

Unrestricted Electives.....**15-36**
Total Units for the Degree.....**180**

Major Adviser. J. Gillespie.

Graduate Study. The Graduate Group in Genetics offers study and research leading to the M.S. and Ph.D. degrees in Genetics.

Related Courses. See Agronomy 207, 221, 222, 223, 224, 225, Animal Genetics 107, 108, 109, 204, 206, 207, 208, Anthropology 151, 152, 153, 157, 157L, 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.

Courses in Genetics

Lower Division Courses

10. Heredity and Evolution (4) I, II. 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 1B or Microbiology 2. Introduction to genetics, emphasizing DNA structure and function, gene regulation including 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. The Staff
 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, transposable elements, and mechanisms of recombination.

102L. Advanced Molecular Genetics Laboratory (4) III. Burtis
 Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 100L, 102A; Biochemistry 101L; consent of instructor; Microbiology 102L recommended. Molecular analysis of gene structure and function. Isolation, manipulation and characterization of DNA, RNA and proteins using recombinant DNA technology. Limited enrollment.

103. Organic Evolution (3) III. Gillespie
 Lecture—3 hours. 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. Langley
 Lecture—4 hours. Prerequisite: course 100; a course in statistics and Mathematics 18B. Population genetics including the effects of natural selection, migration, mutation and genetic drift.

***106. Evolutionary Quantitative Genetics (4) II.** Turelli
 Lecture—3 hours; discussion—1 hour. 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. Offered in alternate years.

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
 Internship—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)
 Tutoring—1-5 hours. 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.** Rodriguez
 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 alternate 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 alternate years.

205. Theoretical Population Genetics (4) II. Gillespie, 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. (S/U grading only.) Offered in alternate years.

209. Molecular Evolution (3) III. Gillespie, Langley
 Lecture—3 hours. Prerequisite: Biochemistry 101B; course 103 recommended. Evolution from the molec-

ular standpoint, including the evolution of genome structure and the organization of single genes and gene clusters, evolution of enzymes and metabolic pathways, molecular clocks, transposons and other movable genetic elements, and molecular polymorphisms. Offered in alternate years. (S/U grading only.)

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)

Richard W. Michelmore, Ph.D., Acting Chair of the Group

Group Office, 1202B Meyer Hall (916-752-9091)

Faculty. Includes members drawn from the Colleges of Agricultural and Environmental Sciences, and Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Genetics offers programs of study and research leading to the M.S. and Ph.D. degrees. The Group is subdivided into three affinity groups: molecular, animal, and plant. Each of these affinity groups provides broad training in genetics, combined with an emphasis specific to its area. Both model genetic organisms and agricultural species are studied using molecular and classical approaches. For detailed information regarding the program address the chairperson of the group.

Graduate Advisers. Consult Genetics Graduate Group Office.

Courses in Genetics

Graduate Courses

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.)

221. Transmission Genetics (3) I. Gepts
Lecture—3 hours. Prerequisite: Genetics 100, Introductory statistics, and calculus. Study of segregation, linkage, and mapping and the modification of Mendel's original genetic model.

222. Cytogenetics (3) II. Dvorak, Murray
Lecture—3 hours. Prerequisite: course 221. Study of cytogenetics including meiosis, recombination, chromosomes, haploidy, aneuploidy, trisomics, monosomics, autopolyploids, and intra- and interspecific manipulation.

223. Molecular Genetics (3) III. Burtis, Williamson
Lecture—3 hours. Prerequisite: course 221 or consent of instructor. Current topics in molecular genetics at a graduate level, with emphasis on the relationship between classical genetic studies and current molecular research, as well as on the molecular techniques used to develop the basic concepts of molecular genetics.

224. Quantitative and Population Genetics (3) I. Touchberry

Lecture—3 hours. Prerequisite: course 221 or consent of instructor. The basic concepts of quantitative and population genetics including gene and genotypic frequencies, multiple factor hypothesis, phenotypic and genotypic values, heritability, selection, genetic variation and evolution in populations, and experimental methodologies.

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.

292. Seminar in Molecular Genetics (1-3) I. The Staff

Seminar—1-3 hours. Prerequisite: course 221. Topics of current interest related to the structure, modification, and expression of genes.

293. Seminar in Cytogenetics (1-3) III. The Staff
Seminar—1-3 hours. Prerequisite: course 221. Topics related to the deletion, duplication, and rearrangement of chromosome regions.

294. Seminar in Quantitative Genetics (1-3) III. The Staff

Seminar—1-3 hours. Prerequisite: course 221. Topics of current interest related to the inheritance of continuous characters.

295. Seminar in Developmental Genetics (1-3) III. The Staff

Seminar—1-3 hours. Prerequisite: course 221. Topics in the area of cell-specific control of genes in development.

296. Seminar in Population, Evolutionary, and Ecological Genetics (1-3) I. The Staff

Seminar—1-3 hours. Prerequisite: course 221. Topics related to the analysis and prediction of genetic changes in populations.

298. Group Study (1-5) I, II, III. Members of the Group (Chairperson in charge)

Prerequisite: consent of instructor. Group Study of selected topics in Genetics. (S/U grading only.)

299. Research (1-12) I, II, III. Members of the Group (Chairperson in charge)
(S/U grading only.)

Geography

(College of Letters and Science)

Jack D. Ives, Ph.D., Chairperson of the Department
Department Office, 280 Kerr Hall
(916-752-0790, or -0792)

Faculty

- Nigel J. R. Allan, Ph.D., Associate Professor
- Conrad J. Bahré, Ph.D., Professor
- Dennis J. Dingemans, Ph.D., Associate Professor
- Deborah L. Elliott-Flisk, Ph.D., Associate Professor
- Howard F. Gregor, Ph.D., Professor Emeritus
- Louis E. Grivetti, Ph.D., Professor (*Geography, Nutrition*)
- Jack D. Ives, Ph.D., Professor
- Stephen C. Jett, Ph.D., Professor
- Janet D. Momsen, Ph.D., Professor
- Marilyn L. Shelton, Ph.D., Professor
- Frederick J. Simoons, Ph.D., Professor Emeritus
- Kenneth Thompson, Ph.D., Professor Emeritus

The Major Program

Geography is a multifaceted discipline defined by its

concern with place. Geographers strive to answer spatial questions regarding the earth's surface and adjacent atmosphere and to describe and explain the character of regions; to ascertain the ways in which humans, historical and contemporary, have used and shaped the earth's surface; and to understand the physical, biotic, and human systems of our global environment and their interactions.

The Program. Both Bachelor of Arts and Bachelor of Science degrees are offered in geography. A.B. students choose one of five possible emphases: 1) general geography, encompassing the whole spectrum of the field; 2) cultural/historical geography, which stresses traditional human uses of the earth and the search of explanations of the different customs, beliefs, and lifeways characteristic of different parts of the world; 3) economic urban geography, which focuses on the locational factors affecting contemporary agricultural, industrial, and commercial activities, as well as on the characteristics and problems of urban centers; 4) physical geography, whose concern is the natural world, including climate, vegetation types, and the many physical features of the land's surface; and 5) regional planning and analysis, which emphasizes how geographic principles are applicable to contemporary urban and environmental concerns. These areas of emphasis will be closely integrated into the department's new specialization in mountain geography. The B.S. program emphasizes physical geography courses with training in other physical and biological sciences and mathematics. A geography minor is also available.

Career Alternatives. The study of geography provides background for students interested in careers in education, business, industry, and government. In business and industry, opportunities for employment include positions in locational analysis, international trade, environmental consulting, transportation planning, remote sensing, environmental-impact analysis, market planning, and aerial photo interpretation. Local and state governments offer opportunities for employment in city, state, and regional planning and environmental analysis, while various federal departments need regional analysts, cartographers, remote-sensing experts, climatologists, and conservationists.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	10
Geography 1, 2, and 5	10
Depth Subject Matter	35-44
Geography 105 or 106; 151; and one UCD regional course from Geography 121-127	11-12
Choose one emphasis from the following five:	
<i>Emphasis I (General)</i>	24-28
One course from each of the following three groups:	
a. Geography 170 or 171;	
b. Geography 141 or 155;	
c. Geography 108 or 115;	
Four additional upper division geography courses.	
<i>Emphasis II (Cultural/Historical)</i>	28
Geography 170; 171; one course from 108, 115, 141, 155.	
Four additional courses from Geography 110, 143, 172, 173, 175.	
<i>Emphasis III (Economic/Urban)</i>	28
Geography 110; 141; 155; one course from 108, 115, 170, 171.	
Three additional courses from Geography 104, 142, 143, 156, 160, 161, 162.	
<i>Emphasis IV (Physical)</i>	31-32
Geography 3; 108; 110; 115; 162; 173; one course from 141, 155, 170, 171.	
One additional course from Geography 102, 112, 116, 117, 161.	
<i>Emphasis V (Regional Planning and Analysis)</i>	26-32
Geography 155 or 156; 110; one additional course from 121-127; and one	

*Course not offered this academic year.

course from 142, 160, 161, 162, 170, 173.
Environmental Biology and Management 110; Environmental Biology and Management 134 or Environmental Studies 171; Political Science 107 or Environmental Studies 161; one course from Economics 115A, Agricultural Economics 148, or Geology 134.

Total Units for the Major45-54

Recommended: Geography 4.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	57-64
Geography 1, 2, 3, and 5	16
Statistics 13 or the equivalent	4
Mathematics 16A, 16B, and 16C; or Mathematics 21A, 21B, and 21C.....	9-12
Computer Science Engineering 10 or 30.....	3-4
Chemistry 1A, 1B, 1C or 4A, 4B, 4C.....	15
Biological Sciences 1A	5
Biological Sciences 1B; or Biological Sciences 1C; or Geology 60-60L; or Physics 6A and 6B.....	5-8
Depth Subject Matter	43-45
Geography 105, 106, 108, 115, 151	20
Two courses from Geography 102, 110, 112, 116, 117, 162, 173.....	7-8
One course from Geography 121-127	3-4
Four additional upper division, letter-graded units in Geography.....	4
Nine additional upper division units chosen in consultation with the undergraduate adviser.....	9
Total Units for the Major	100-109

Recommended

Geography 4; Physics 8A, 8B and 8C; Chemistry 8A and 8B.

Addendum

The B.S. major provides a wide diversity of possible themes, including geomorphology, climatology, zoogeography, plant geography, nutritional geography, water-resource studies, and mathematical geography. An individual's program may emphasize one or more of these themes, and is planned in consultation with the major adviser.

Minor Program Requirements:

Letters and Science students who do not major in Geography may satisfy the requirements for a minor in the field by successfully completing the minimum units as follows. When choices of individual courses are required, these must be made in consultation with the major adviser.

	UNITS
Geography	19-20
<i>Minor I (General)</i>	
Geography 151, plus one course from each of the following four groups:	
Geography 108, 115, or 173	
Geography 170 or 171	
Geography 155, 160, or 161	
Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127	
<i>Minor II (Physical)</i>	
Geography 102, 108, 115, and 173, plus one course from 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.	
<i>Minor III (Cultural)</i>	
Geography 170, 171, and 173, plus one course from each of the following two groups: Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127, and Geography 143, 172, or 175	
<i>Minor IV (Economic)</i>	
Geography 110 and 141, plus one course from each	

of the following three groups:

Geography 142, 143, or 156
Geography 160, 161, 162, or 170
Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.

Minor V (Environmental/Resource)

Geography 160, 161, 162, 173, and 175.

Minor VI (World Regional)

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. Elliott-Fisk; II. Jett
Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

2. Introduction to Cultural Geography (3) I. Jett; II. Allan; III. Allan

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. Jett; II. Allan; III. Allan

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. 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) II. Dingemans; III. Momsen

Lecture—3 hours. The location of economic and urban activities. Patterns and theories of spatial organization: resource development, agricultural and manufacturing regions, urban systems, and urban structure. General Education credit with concurrent enrollment in course 5G: Contemporary Societies/Introductory.

5G. Economic and Urban Geography: Discussion (1) II. Dingemans; III. Momsen

Discussion—1 hour; short papers. Prerequisite: course 5 concurrently. Small group discussion of topics and readings assigned for course 5. Preparation and discussion of short papers. General Education credit with concurrent enrollment in course 5: Contemporary Societies/Introductory.

***6. Human Impacts on the Landscape (4)** I. The Staff
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. Jett; III. Allan

Lecture—3 hours. The major geographic regions of the world; their origins, physical environments, cultures and economies; their interactions and global roles. Designed for non-majors.

***50. Geography and Environmental and Regional Planning (3)** III. Dingemans

Lecture—3 hours. Principles of spatial planning for regional change. Policies for environmental, economic, and social modifications. Illustrated case studies include: U.S. city planning, USSR industrial and population shifts, European regional plans, Chinese agricultural and environmental programs.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Independent Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor, primarily for lower division students. (P/NP grading only.)

Upper Division Courses

102. Field Course in Physical Geography (4) III.

Elliott-Fisk

Lecture and field trip—normally 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. The Staff

Lecture—1 hour; laboratory—8 hours. Prerequisite: course 4 or consent of instructor. Compilation and generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction.

106. Aerial Photo Interpretation and Remote Sensing (4) 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. The Staff

Lecture—1 hour; laboratory—8 hours. Prerequisite: course 105. Advanced principles and techniques of cartographic representation. Emphasis on scribing, plate-making, process photography, color separation, and color proofing. Use of contemporary cartographic and photographic equipment utilized in producing maps.

***108. Analysis of Landforms (4)** I. 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)** III. 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. Empha-

sis on the Quaternary history of coastal landscapes. Offered in alternate 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 alternate 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 alternate years.

117. Quaternary Environments (3) I. Elliott-Fisk

Lecture—3 hours. Prerequisite: course 1 or Biological Sciences 1A or consent of instructor. Introduction to the character, timing, and magnitude of environmental changes during the Quaternary (Pleistocene and Holocene). Analysis of methods of paleo-environment identification. Survey of the Quaternary record for selected regions.

118. Mountain Geocology: Physical Geography (4) II. Ives

Lecture—3 hours; term paper. Prerequisite: course 1 or other introductory natural science course. Broad overview of world mountain systems, including tectonics and structure, climate and vegetation, geomorphic processes and natural hazards. Will integrate relevant section of cognate disciplines to focus on three-dimensional character of mountain regions—a physical geography of mountains.

***120. Deserts of California and the Southwest (3) II.** Jett

Lecture—3 hours. Prerequisite: courses 1 and 2 or the equivalent recommended. Physical and human geography of the Mojave, Sonoran, and Chihuahuan deserts of the U.S., the Colorado Plateau, and the southern Great Basin. Desert origins, climate, vegetation, and landforms. Cultures and histories of native tribes, Hispano-Americans, and Anglo-Americans. Offered in alternate years.

***120L. Field Excursion to Californian and Southwestern Deserts (2) III.** Jett

Fieldwork—60 hours minimum (1 week). Field excursion to examine physical and human geography of selected desert areas in California and/or Nevada, Arizona, and Utah. May be repeated for credit. Limited enrollment; preference given to students having completed course 120. (P/NP grading only.) Offered in alternate years.

***121. North America (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Landscapes and lifeways in the United States and Canada, and the ways in which physical and human forces have contributed to their variety. Regional stresses within and between the two countries.

122A. Mexico and Central America (4) I. Bahre
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of Middle America. Approach will be cultural/historical and ecological. Offered in alternate years.

***122B. South America (4) II.** Bahre

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of South America. The approach will be cultural/historical and ecological. Offered in alternate years.

***123. Western Europe (3) I.** The Staff

Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social, and political problems of the countries of Western Europe.

124. The Soviet Union and Eastern Europe (4) 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 preparation: 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.** The Staff

Lecture—3 hours. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara.

***126. Southern Asia (3) III.** The Staff

Lecture—3 hours. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Southern Asia. Offered in alternate years.

***127. Contemporary East Asia (4) III.** Dingemans

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in the social sciences; course 2 or 5 recommended. Human use of the earth in East Asia. Location and nature of resources, agriculture, industry, and cities. Modernization of traditional rural and urban landscapes. Emphasis on contemporary China and Japan as contrasting paths to economic development.

***131. California (4) III.**

Lecture—3 hours; discussion—1 hour. The regional nature and variety of California: landforms, climates, vegetation, and soils; water, agriculture, and the cities. Ecological problems caused by increasing population and technological pressures on these environments.

141. Organization of Economic Space (4) II. Momen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Survey of the principal environmental, economic, social, political, and cultural forces contributing to the regionalization of the world's economic activities. Outline of the more important regional patterns resulting from the interplay of these forces. Emphasis will also be put on these aspects as they pertain to the problems of regional disparities both within and between nations.

142. Geography of Agriculture (4) III. Momen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Distribution and areal variety of the world's food-producing areas, and the ways physical, historical, cultural, and economic factors have influenced these aspects of agriculture. Current and future trends and associated resource problems.

***143. Political Geography (4) I.** The Staff

Lecture—3 hours; term paper. Areal differentiation of major natural and cultural phenomena affecting the world's political organization.

***151. History of Geographic Thought (4) III.** The Staff

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) III. 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 preparation: 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) I.** The Staff

Lecture—3 hours. Prerequisite: upper division standing. Principal world patterns of resource distribution. Concentrations and voids, and their significance for economic development and the welfare of the state. Focus on both natural and human resources of the geographic complex. Resource status of main economic regions.

***161. Conservation of Resources and Environment (4) 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.

168. Mountain Geocology: Human Geography (4) II. Allan

Lecture—3 hours; term paper. Prerequisite: course 118, or consent of instructor. Analysis of traditional adaptations of mountain cultures to their habitats; resource use and environmental degradation; tourism impacts and Third World development issues. Emphasis on Himalayas; also Andes, Alps, and Rocky Mountains, providing historical perspective and discussion of current environmental crises.

170. Cultural Ecology (4) I. Jett

Lecture—3 hours; term paper. Prerequisite: course 2 or Anthropology 2. Geographic theories of environment-man relations. Ecological 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 preparation: 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 preparation: Geography 2 or Anthropology 2.

***172. Animals and Culture History (4) III.** The Staff

Lecture—4 hours. Prerequisite: course 2, Anthropology 2, or consent of instructor. Theories of animal domestication; spread of domesticated animals in Old and New Worlds; contrasting roles of domesticated animals in human ecology through time; pastoral nomadism and other animal-based economies.

173. Humans and Vegetation Change (4) III. Bahre

Lecture—3 hours; term paper. Prerequisite: course 1 or Biological Sciences 1A, or consent of instructor. Role of humans in modifying the earth's vegetation. Emphasis on cultural plant geography, factors of plant distribution, classification and mapping of vegetation, world vegetation patterns, human impact on major regions, and case studies of land use and vegetation change.

175. Geography of Food and Diet (4) II. Grivetti

Lecture—4 hours. Prerequisite: course 2 or Anthropology 2; Nutrition 20 recommended. Consideration of the cultural and environmental factors that influence dietary practices; historical development of

food habits; food use in different economic systems, both traditional and contemporary. Offered in alternate years.

192. Student Internship in Geography (2-4) I, II, III. The Staff

Internship—5-15 hours at employing agency; term paper. Prerequisite: consent of undergraduate Geography major adviser and consent of instructor. Supervised program of student internships with public agencies dealing with geographical problems. The application and evaluation of theoretical concepts through work experience with a variety of assignments and work schedules. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200. Research Trends in Geography (1) I. The Staff (Chairperson in charge)

Seminar—1 hour. Major current research themes and trends in geography. (S/U grading only.)

201. Sources and General Literature of Geography (4) I, II, III. The Staff

Discussion—4 hours. Prerequisite: graduate status in geography; consent of instructor. Designed for students preparing for higher degrees in geography. May be repeated for credit in one or more of the following subfields: physical, cultural, economic, urban, historical, political, conservation, and regional geography.

290. Seminar: Selected Regions (4) III. Ives

Seminar—3 hours. Region to be announced annually.

291. Seminar in Cultural Geography (4) II. Momsen

Seminar—3 hours.

***292. Seminar in Plant Geography (4)**

Seminar—3 hours; seminar paper. Prerequisite: graduate standing. Examination of that aspect of cultural plant geography dealing with human impacts and vegetation change in the earth's major biomes. Particular emphasis on the New World's savannas, deserts, and grasslands. Offered in alternate years.

***294. Seminar in Climatology (4)** II. Shelton

Seminar—3 hours.

295. Seminar in Urban Geography (4) I. Dinges

Seminar—3 hours.

***296. Seminar in Agricultural Geography (4)** III.

The Staff

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.)

Harry W. Green II, Ph.D., Professor
Charles G. Higgins, Ph.D., Professor Emeritus
Anne M. Hofmeister, Ph.D., Assistant Professor
Louise H. Kellogg, Ph.D., Assistant Professor
Charles E. Leshner, Ph.D., Assistant Professor
Stanley V. Margolis, Ph.D., Professor
Robert A. Matthews, A.B., Senior Lecturer
James S. McClain, Ph.D., Associate Professor
Eldridge M. Moores, Ph.D., Professor
Jeffrey F. Mount, Ph.D., Associate Professor
Peter Schilfman, Ph.D., Lecturer
Philip W. Signor, Ph.D., Associate Professor
Howard J. Spero, Ph.D., Assistant Professor
Robert J. Twiss, Ph.D., Associate Professor
Geerat J. Vermeij, Ph.D., Professor
Kenneth L. Verosub, Ph.D., Professor

The Major Programs

"Civilization exists by geological consent—subject to change without notice."

Will Durant

Geology is the study of the Earth, and in particular the history, the structure, the evolution of life, and the processes that have molded the Earth and its inhabitants. The coming of the space age has also extended the field to include the solid planets of the solar system. Although often attracted to the study of geology by an aesthetic appreciation and enjoyment of the earth, geologists commonly approach their studies from an interest either in the academic or the applied aspects of the science.

The academic aspects include the study of the history of life, the Earth, and the planets, and of the processes that drive the historical evolution. It is the study of this historical evolution through "deep time" that fundamentally distinguishes geology from most of the other physical sciences. The study of the processes that drive this evolution can involve the application of any of the physical or life sciences to understanding the Earth. In this sense, geology is truly an interdisciplinary science.

The applied aspects of the science generally involve the interaction between humans and the earth. Applied studies include the study of mineral resources including oil and water; identification and mitigation of Earth hazards such as earthquakes, landslides, and volcanic eruptions; identification and mitigation of polluted ground water; and land use planning.

The Program. Students interested in becoming professional geologists or continuing their geological studies at the graduate level should elect the Bachelor of Science degree program. The Bachelor of Arts program is designed for students interested in an interdisciplinary program of study, or who plan to go into pre-college teaching. Both programs include twelve units of upper division electives that provide students an opportunity to emphasize an aspect of the field of particular interest to them. The electives are not restricted to geology courses but must be chosen to provide a relevant, coherent, and in-depth program of study which must be approved by an undergraduate advisor before they are taken. Transfer students should have completed as much as possible of the "preparatory subject matter" listed below. High school preparation for either program should include high school chemistry and four years of mathematics or the equivalent.

Internships and Career Alternatives. The largest employer of geologists has traditionally been the oil industry, although recently more opportunities have been available in environmental geology with consulting firms and government agencies. Government organizations and research laboratories also employ geologists in a variety of other capacities. There is a growing need for earth science teachers at all pre-college levels, and colleges and universities provide opportunities in teaching and research. Entry level positions are available with a Bachelor's degree. A Master's degree is the usual professional level degree, and a Ph.D. is generally required for research and academic positions. Internships during undergraduate training are a means of exploring potential career opportunities and can lead to posi-

tions after graduation. Davis students have interned at the California Division of Mines and Geology, the State Department of Water Resources, and various consulting firms.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter44-45
Geology 3, 3L, 50, 50L, 60, 60L.....14
Mathematics 16A-16B-16C or 21A-21B.....8-9
Chemistry 1A-1B or 4A-4B.....10
Physics 5A-5B-5C.....12

Depth Subject Matter39

Geology 102, 105, 105L, 106, 110, 110L, 122, 12327
Additional upper division electives chosen from selected courses in geology and related fields approved *in advance* by the major adviser (see adviser for list of approved courses).....12

Total Units for the Major83-84

Recommended

Chemistry 1C or 4C; Geology 3, 3L; Statistics 13 or 102.

B.S. Major Requirements:

UNITS

Preparatory Subject Matter56
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 9A-9B-9C or 5A-5B-5C.....12

Depth Subject Matter54

Geology 102, 105, 105L, 106, 110, 110L, 118, 122, 12335
Geology 190 (repeat course at least once).....2
One course chosen from Geology 124, 1255
Additional upper division electives chosen from selected courses in geology and related fields approved *in advance* by major adviser (see adviser for list of approved courses).....12

Total Units for the Major110

Recommended

Electives for general geology emphasis: Geology 108, 108L, completion of 124, 125 sequence plus one other course (consult adviser).

Additional recommended courses: one or more of the following courses, depending on emphasis in geology: Mathematics 22A, 22B, 22C, Statistics 104, 106, 108, 110.

Major Advisers. A.B. degree: R. Cowan; B.S. degree: R. Cowan, S.V. Margolis, R.J. Twiss.

Minor Program Requirements:

Students in other disciplines may elect to complete a minor in Geology by choosing a geological subject emphases listed below. On transcripts the minor will appear as a minor in *Geology*.

UNITS

General Geology emphasis22
Geology 50 and 50L (or 1, 1G, and 1L).....5
Geology 105, 105L, 106.....9
Geology 108 and 108L or 110 and 110L.....5
Geology 113, 115, or 116.....3
Minor Advisers. S.V. Margolis, R.J. Twiss.

Engineering Geology emphasis19-22

Geology 50 and 50L.....5
Civil Engineering 171, 1725
Three courses chosen from Civil Engineering 175, Geology 117A, 117B, 134, Soil Science 118, 120 Water Science 142, 1499-12

Geology

(College of Letters and Science)

Howard W. Day, Ph.D., Chairperson of the Department

Department Office, 174 Physics-Geology Building (916-752-0350/0351)

Faculty

Sandra J. Carlson, Ph.D., Lecturer
Richard Cowen, Ph.D., Senior Lecturer
Robert E. Criss, Ph.D., Associate Professor
Howard W. Day, Ph.D., Professor
James A. Doyle, Ph.D., Professor (*Botany*)
Graham E. Fogg, Ph.D., Associate Professor (*Land, Air, and Water Resources*)

Minor Adviser. R.A. Matthews

Geochemistry emphasis.....18-20
 Chemistry 110A, 110C6
 (Chemistry majors must substitute one of the elective courses for Chemistry 110C.)

Geology 60, 60L, 115, 180.....9
 One elective course chosen from Chemical Engineering 151, Chemistry 126, Engineering 130, 134, Geology 150A, Soil Science 102, Water Science 180.....3-5

Minor Adviser. R.E. Criss.

Geomorphology emphasis.....22

Geology 50 and 50L (or 1, 1G, and 1L).....5
 Geology 152 or Geography 1064
 Geology 153 or Geography 1084
 Geology 135 or 154.....3

At least six additional units chosen from
 Civil Engineering 171, 172, 177
 Geography 112, 117, 118
 Soil Science 118, 120
 Water Science 141 or Civil Engineering 142.....6

Minor Adviser. R.J. Twiss

Oceanography emphasis.....20-25

Geology 106, 116, 150A, 150B, 150C17
 One course chosen from Environmental Studies 100, 151, Geology 111A, 111B, S119, Water Science 1803-8

Minor Adviser. S. V. Margolis.

Paleobiology emphasis.....18-21

Geology 110 and 110L or 107 and 107L.....5
 Geology 111A or 111B; 145 or 1467
 At least six additional units from the following: Anthropology 151 or 152 Botany 116, 140 Genetics 103, Geology 111A, 111B, 145, 146, 150C Zoology 105, 112, 125, 148.....6-9

Minor Adviser. R. Cowan.

Interdisciplinary minors. The Geology Department administers two interdisciplinary minor programs in **Environmental Geology and Geophysics** which may be completed by students majoring in any discipline including Geology. Programs for these minors are listed separately in this catalog in alphabetical order. For Geology majors, one course at most from these minor programs can be counted toward satisfaction of the Geology degree requirements.

Teaching Credential Subject Representative. R. Cowan. See also under Teacher Education Program.

Graduate Study. The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Graduate Advisers. J.F. Mount, J.S. McClain.

Courses in Geology

Lower Division Courses

1. The Earth (3) I, III. The Staff

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, III. The Staff

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, III. The Staff

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. The Staff

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. The Staff

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. The Staff

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) III. Carlson, Cowen

Lecture—2 hours. Introduction to evolutionary biology, paleobiology, ecology and paleoecology, using dinosaurs as case studies.

17. Earthquakes and Other Earth Hazards (2) I. Verosub

Lecture—2 hours. The impact of earthquakes, volcanoes, landslides and floods on Man, his structures and his environment. Discussion of the causes, effects, and solution of geologic problems in rural and urban settings.

20. Geology of California (2) II. Moores

Lecture—2 hours; demonstration—1 hour. The geologic history of California, the origin of rocks and the environments in which they were formed, the structure of the rocks and the interpretation of their structural history, mineral resources, and appreciation of the California landscape.

43. Form, Function, and Evolution: The Molluscan Shell (3) I. Vermeij

Lecture/discussion—2 hours; term paper. Prerequisite: course 1, 3, or Biological Sciences 10. Evolutionary principles relating form, function, and environment are explained through the study of shells of living and fossil molluscs. Topics include shell geometry, mechanical design, adaptation to enemies, and the distribution of shell architectural types in space and time. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Geology 1 or 3 or Biological Sciences 10.

50. Physical Geology (3) II. Green

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. Green

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. Hofmeister

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. Hofmeister

Laboratory—6 hours. Prerequisite: course 60 (preferably taken concurrently). Morphological crystallography; stereographic projection; identification of the common rock-forming minerals.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

102. Field Geology (5) III. Twiss

Lecture—1 hour; laboratory—2 hours; field study—8 full days. Prerequisite: courses 105L, 106, 123, 124 (may be taken concurrently); course 125 recommended. Instruction in geologic mapping techniques; field geologic study of selected areas to expose students to a variety of geologic features. A geologic map, cross-section stratigraphic section and description of geologic rock units is required (30 hours minimum).

105. Structural Geology (3) II. Twiss

Lecture—3 hours. Prerequisite: courses 50-50L; Physics 5A or 9A; Mathematics 21A, 21B recommended. Description and origin of the deformational features of the earth's crust. Brittle deformation, stress, faults and fractures; ductile deformation, strain, folds and foliations. Experimental rock deformation.

105L. Structural Geology Laboratory (2) II. Twiss

Lecture-laboratory—3 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; 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. Vermeij

Lecture—3 hours. Prerequisite: courses 3-3L or Biological Sciences 1B. The evolution and ecological structure of the biosphere from the origin of life to the present, 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. Vermeij

Laboratory—6 hours. Prerequisite: courses 3-3L or Biological Sciences 1B; 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. Cowan

Lecture—3 hours. Prerequisite: courses 3, 3L. Provides geology majors with a thorough introduction to the fossil record, interpretation of data from the fossil record, and associated problems of evolution, paleoecology, and biostratigraphy. Not open to students who have received credit for course 107.

110L. Invertebrate Paleontology Laboratory (2) I. Cowan

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. The Staff

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and

ecology of the major phyla of invertebrates. Offered in alternate years.

***111B. Paleobiology of Protists (4) II.** The Staff
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms. Offered in alternate years.

113. The Solar System (3) III. Hofmeister
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 preparation: any introductory physical science GE course in the area of Nature and Environment.

113G. The Solar System: Discussion (1) III. Hofmeister
Discussion—1 hour. Prerequisite: course 113 concurrently. Small discussion groups and preparation of papers for course 113.

114. Climates of the Past: Key to the Future (3) II. Spero
Lecture—3 hours. Prerequisite: Chemistry 1A or course 1 or Biological Sciences 1A or the equivalent. Analysis of present day evidence for climatic warming and the greenhouse effect with comparison to the history of Earth's climate fluctuations over the last 70 million years. Past and present climate records are used to examine potential future climatic scenarios.

115. Geochemistry (3) I. Criss
Lecture—3 hours. Prerequisite: Chemistry 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. Margolis
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 preparation: Biological Science 10, Chemistry 10, or Geology 1.

116G. The Oceans: Discussion (2) II. Margolis
Discussion—2 hours. Prerequisite: course 116/Environmental Studies 116 concurrently. Scientific method applied to discovery of the processes, biota and history of the oceans. Group discussion and preparation of papers. (Same course as Environmental Studies 116G.) General Education credit with concurrent enrollment in course 116: Nature and Environment/Non-Introductory. Recommended GE preparation: see course 116 above.

117A. Geophysics: Gravity and Magnetism (3) II. Kellogg
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 9C 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 5B or 9B 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 (6) Extra-session summer. Mount

Six weeks in field. Prerequisite: course 102. Preparation of a geologic map and report on a selected field area.

119. Field Studies in Marine Paleocology (9) Summer. Farmer
Lecture—12 hours; laboratory—25 hours. Prerequisite: one course in biology or geology and consent of instructor. Lectures and field-laboratory studies of physical and biological aspects of nearshore marine environments, and the reconstruction of ancient environments through the study of fossil assemblages and sedimentary rocks in nearby coastal areas. Full time residence at Bodega Marine Laboratory is required. A \$25.00 lab fee is required.

122. Optical Mineralogy (3) II. The Staff
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. Leshar
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. The Staff
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) II. 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.

131. Earth Science, History, and People (4) III. Cowen
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; course 1. Study of interplay between the earth and its human inhabitants through history, including consideration of acute events like earthquakes and eruptions as well as the geology of resources, topography, and water. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Geology 1-1G.

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.

135. Rivers of California: Geology and Land Use (3) III. Mount
Lecture—2 hours; discussion-laboratory—3 hours. Prerequisite: courses 1, and 1G or 1L. Analysis of the conflict between geologic processes and the urbanization and resource exploitation of California's watersheds. Mining, logging, and dam construction. Case studies of Sierra Nevada watersheds. Field study includes two raft trips on Sierran rivers and visit to Auburn Dam site. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Geology 1.

***140. Geologic Data Collection and Report Presentation (2) III.** The Staff
Lecture—2 hours. Prerequisite: upper division standing and a major in Geology. Collection, organization and presentation of data for geologic reports. Participants will analyze published reports, write syntheses of published reports and write abstracts.

144. Evolution and the Fossil Record (4) II. Signor
Lecture—3 hours; discussion—1 hour. Prerequisite:

course 3. Patterns of evolution recorded in the geologic record. Models of organic evolution. Origination and extinction of taxa. The Neo-Darwinian synthesis and its impact on the interpretation of the fossil record. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Geology 3.

***145. Paleocology (3) II.** Signor
Lecture—3 hours. Prerequisite: course 107. Principles and methods of environmental reconstruction of ancient animal and plant communities. Course includes statistical methods in paleocology; principles of biostratigraphy.

***146. Evolutionary Paleontology (3) I.** Vermeij
Lecture—3 hours. Prerequisite: course 107 or 110. Principles of evolution from the special perspective of the fossil record. Facts and inferences on the origin of species and higher taxa. Survey of adaptive radiations and major extinctions.

150A. Physical and Chemical Oceanography (4) I. Powell (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 116; Physics 9B; Mathematics 22C; Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geochemical cycles. Offered in alternate 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.** Spero
Lecture—3 hours. Prerequisite: Biological Sciences 1A and a course in general ecology or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea, and plankton communities. Existing knowledge and contemporary issues in research will be equally stressed. A portion of the course will be devoted to man's use of and impact on the ocean. Offered in alternate years. (Same course as Environmental Studies 150C.)

***152. Petrology and Remote Sensing (4) II.** Higgins
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1L or 50L; course 105 recommended. Field use of aerial photographs: types and availability, stereoviewing, and basic geometry. Geological uses and interpretation of aerial photographs and of images obtained by remote sensing.

***153. Geomorphology (4) II.** Higgins
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 50-50L or 1-1L; Geography 1 recommended. Landforms, landscapes, and the processes that shape them. An introduction to geomorphic observation and theory. Alternates with and complements course 154. Offered in alternate years.

***154. Environmental Geomorphology (3) II.** Higgins
Lecture—3 hours. Prerequisite: courses 50-50L or 1-1L; Geography 1 recommended. Aspects of geomorphology that relate to Man's use of the natural environment. Alternates with and complements course 153. Offered in alternate years.

***162. Stress and Deformation (4) II.** Green
Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 9B; Mathematics 22A, 22C, and Physics 9C recommended. Introduction to tensor analysis: tensor notation transformations, representation quadric, Mohr-circle construction; stress, strain; strain-rates, elasticity. Solution of general, three-dimensional problems with geological application.

180. Sample Preparation and Techniques (1) II. Winter
Laboratory—3 hours. Prerequisite: course 122. Intro-

duction 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)

Internship. Prerequisite: upper division standing; project approval prior to internship. Supervised work experience in geology. May be repeated for credit for a total of 10 units. (P/NP grading only.)

194A-194B. Senior Thesis (3-3) I-II-III. The Staff (Chairperson in charge)

Prerequisite: open to geology majors who have completed 135 units and who do not qualify for the honors program. Guided independent study of a selected topic, leading to the writing of a senior thesis. (Deferred grading only, pending completion of course sequence.)

194HA-194HB. Senior Honors Project (3-3) I, II, III. The Staff (Chairperson in charge)

Independent study—9 hours. Prerequisite: open to Geology majors who have completed 135 units and who qualify for the honors program. Guided independent study of a selected topic, leading to the writing of an honors thesis. (Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: senior standing in geology or consent of instructor.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

***206. Stratigraphic Analysis (3) III.** Mount

Lecture—3 hours. Prerequisite: courses 105L and 106 or consent of instructor. Advanced historical geology; analysis of stratigraphy and geologic history of North America and selected parts of other continents. Emphasis on interpreting lithologic assemblages and stratigraphic relations in terms of modern tectonic-depositional models. Offered in alternate years.

***209. Origin and Significance of Metamorphic Textures (4) III.** Green

Seminar—3 hours; laboratory—3 hours. Interpretation of metamorphic textures in terms of surface energy anisotropy, growth anisotropy, crystal deformation processes, and disequilibrium phenomena. Offered in alternate years.

***213. Studies in Geomorphology (3) I.** Higgins
Lecture-seminar—3 hours. Prerequisite: course 153 or Geography 108. Topics selected from: studies of landforms and landscape development and of the action of formative processes, methods of analysis of geomorphic problems, development of geomorphic theory. Topics change from year to year. May be repeated three times for credit.

215. Advanced Geochemistry (3) II. Criss

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 alternate years.

***218A. Structural Analysis I: Macrofabrics (3) II.** Twiss

Seminar—3 hours. Prerequisite: consent of instructor. Geometric and kinematic analysis and interpretation of mesoscopic and macroscopic geologic structures and fabrics; geometry of folding, superposed folding, and folded lineations; symmetry arguments in the interpretation of fabrics; determination of slip lines of deformation; regional structural synthesis. Offered in alternate years.

***218B. Structural Analysis II: Microfabrics (4) III.** Green

Seminar—3 hours; laboratory—3 hours. Prerequisite: consent of instructor; course 218A recommended. Microscopic structural aspects of deformed metamorphic rocks, emphasizing deformation features and the origin and significance of preferred crystallographic orientation. Offered in alternate years.

219. Special Studies in Marine Geology and Paleogeology (6-9) Summer. Farmer

Discussion—5 hours; seminar—3 hours; laboratory—20 hours. Prerequisite: graduate standing or completion of course 119, and consent of instructor. Independent field and laboratory investigation of selected topics in marine geology and paleogeology.

220. Mechanics of Geologic Structures (3) III. Twiss

Lecture—2 hours; seminar—1 hour. Prerequisite: course 162, or consent of instructor and course 105. Application of principles of continuum mechanics to understanding development of geologic structures such as folds, fractures, faults, dikes, cleavage, boudinage. Offered in alternate years.

226. Advanced Sedimentation and Sedimentary Petrology (4) III. Mount

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124 or consent of instructor. Advanced petrographic and stratigraphic study of major sedimentary rock suites. Lecture emphasis on recognition and interpretation of the spatial and temporal variations in sedimentary rock textures and mineralogies. Laboratory focus on provenance and diagenesis. Subjects vary yearly. May be repeated for credit. Offered in alternate years.

227. Stable Isotope Biogeochemistry (3) III. Spero

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Application of stable isotope techniques to paleoclimatic, paleontologic, paleoceanographic, ecological and anthropological research problems. Emphasis on carbon, oxygen, nitrogen, hydrogen and sulfur stable isotopes.

228. Marine Geology (3) III. Margolis

Lecture—3 hours. Prerequisite: courses 106, 116, 150B or 165, or consent of instructor. Critical discussions and review of selected topics in marine geology such as paleoceanography, biostratigraphy of the ocean basin, evolution of ocean basins and margins, and sea-bed mineral resources. Topics vary yearly. May be repeated for credit.

230. Advanced Mineralogy (3) II. Hofmeister

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 alternate years.

***231. Mineral Physics Seminar (3) I.** Hofmeister

Seminar—3 hours. Prerequisite: course 230. Critical review of selected topics in mineral physics (e.g., the earth's thermal state; elastic properties and equations of state; phase transitions and mantle petro-

logy; earth's structure and its evolution; transport phenomena in the earth's interior). May be repeated for credit. Offered in alternate 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 alternate 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 alternate years.

240. Geophysics of the Earth (3) I. Kellogg

Lecture—3 hours. Prerequisite: Earth Sciences and Resources 201, Physics 9B, Mathematics 22B. Physics of the earth's crust, mantle, and core. Laplace's equation and spherical harmonic expression of gravity and magnetic fields. Elastic wave equation in geologic media. Body and surface seismic waves. Equations of state, thermal structure of the earth. Offered in alternate years.

241. Geomagnetism (3) I. Verosub

Lecture—3 hours. Prerequisite: graduate standing. Nature and origin of the Earth's magnetic field. Present field and recent secular variation. Spherical harmonic analysis. Paleosecular variation. Polarity transitions and geomagnetic excursions. Statistics of polarity intervals. Dynamo theory. Planetary magnetism. Offered in alternate years.

***242. Paleomagnetism (3) I.** Verosub

Lecture—3 hours. Prerequisite: graduate standing. Principles and applications of paleomagnetism. Physical basis of rock and mineral magnetism. Field and laboratory techniques. Instrumentation. Analysis of paleomagnetic data. Statistical methods. Rock magnetic properties. Geological and geophysical applications. Offered in alternate years.

***245. Metamorphic Petrology (5) I.** Day

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 125 or consent of instructor. Metamorphic processes; origin and characteristics of metamorphic rocks; laboratory study of representative rock suites in hand specimen and thin section. Offered in alternate years.

***246. Physical Chemistry of Metamorphic Processes (3) II.** Day

Lecture—3 hours. Prerequisite: course 125, Chemistry 110A, or consent of instructor. Physicochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in alternate years.

***247. Metamorphic Petrology Seminar (3) II.** Day

Seminar—3 hours. Prerequisite: course 245; course 246 recommended. Selected topics in metamorphic petrology (e.g., mass transport processes, tectonic settings, geothermometry, thermal structure of metamorphic belts, regional studies). May be repeated for credit when topic is different. Offered in alternate years.

250. Advanced Geochemistry Seminar (3) I. Criss

Seminar—3 hours. Prerequisite: course 115 or consent of instructor. Critical review of selected topics in geochemistry including: ore genesis, hydrothermal and geothermal fluids, recent and ancient sediments, isotope geology, origin and chemistry of the oceans. Subject varies yearly depending on student interest. May be repeated for credit. Offered in alternate years.

254. Phase Equilibria (3) I. The Staff

Seminar—3 hours. Prerequisite: Chemistry 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.** Carison; II. Signor; III. Vermeij

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 alternate years.

***269. Evolutionary Biology of Protista (3) II.** The Staff

Seminar—3 hours. Prerequisite: course 111B. Analysis and discussion of selected topics on the evolution of single-celled organisms with emphasis on their fossil record and biology. Offered in alternate years.

280. Igneous Petrology (3) II. Leshner

Seminar—2 hours; laboratory—3 hours. Prerequisite: course 123. Integrated laboratory, field study, and seminar on igneous processes and products.

282. Geological X-Ray Spectrometric Analysis (4) III. Schiffman

Lecture—3 hours; laboratory—3-4 hours. Prerequisite: course 60, Chemistry 4C, Physics 9D, graduate standing in Geology. Theory of generation and detection of x-rays as applied to analytical chemistry of rocks and minerals. Laboratory sessions on use of the x-ray fluorescence spectrometer, electron microprobe, and x-ray diffractometer.

290. Seminar in Geology (1) I, II, III. The Staff

Seminar—1 hour; discussion—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. (S/U grading only.)

291. Geology of the Sierra Nevada (1) III. Day, 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 alternate years.

***296. Advanced Problems in Tectonics (3) II.** Moores

Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Seminar dealing with current problems in tectonics of selected regions. Topics will change from year to year. Emphasis on study of recent literature. May be repeated for credit. (P/NP grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

firm foundation of geophysics classes, as well as the vast diversity of subdisciplines from many departments that are included in geophysics.

The minor is sponsored by the Department of Geology, 174 Physics/Geology Building.

Faculty adviser: J.S. McClain, Department of Geology, 275A Physics/Geology, 752-7093.

Minor Program Requirements:

	UNITS
Geophysics	21-24
Geology 117A, 117B, S181.....	9
Applied Science Engineering 115.....	3
One course sequence chosen from the following:.....	9-12
a. Atmospheric Science 120, 191A, 191B;	
b. Electrical and Computer Science Engineering 112, 151, 161;	
c. Geology 105, 162, Physics 105C;	
d. Mathematics 128A, 128B, 128C;	
e. Physics 104A, 104B, 105C.	

German

(College of Letters and Science)

Roland Hoermann, Ph.D., Chairperson of the Department

Department Office (German and Russian), 422 Sproul Hall (916-752-2114)

Faculty

Carrie Asman, Ph.D., Assistant Professor
Wilbur A. Benware, Ph.D., Associate Professor
Clifford A. Bernd, Dr.Phil., Professor
Gail Finney, Ph.D., Professor
Ulrich Galer, Dr.Phil., Visiting Professor
Ingeborg Henderson, Ph.D., Senior Lecturer
Roland W. Hoermann, Ph.D., Professor
Anna K. Kuhn, Ph.D., Professor
Winder McConnell, Ph.D., Professor
Karl R. Menges, Dr.Phil., Professor
H. Guenther Nerjes, Ph.D., Professor Emeritus
Fritz Sammern-Frankenegg, Dr.Phil., Lecturer
Peter M. Schaeffer, Ph.D., Professor
Helmut Schneider, Dr.Phil., Professor

The Major Program

The German major explores in depth the literature, language, and culture of the German-speaking world. The *General Program* is designed to accommodate specifically those students whose interest lies in literary or linguistic studies, while the *Area Studies Emphasis* addresses the needs of students wishing to obtain a broader knowledge of the contributions of the German-speaking world to fields such as music, art, history, philosophy, economics, etc.

The Program. The department's primary emphasis on literary figures, movements and themes finds expression in the common core of upper-division literature electives characterizing both programs. Beyond the common courses in advanced conversation and composition (101, 102 and 103) shared by students emphasizing area studies, literature, or language interests, those majors desiring maximum practice in spoken and written German, as well as in listening comprehension, will find opportunities for such exposure especially in any of the upper-division literature courses that are offered in German.

Career Alternatives. Completion of the major will prepare the student for graduate study in German. Both programs (*general* and *area studies*) prepare students for career opportunities in fields such as international relations, business, the sciences, and the arts, as well as permitting admission to such professional curricula as law and medicine.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8-23
German 1-2-3 (or the equivalent).....	0-15
German 4 or 6A-6B.....	4
German 51.....	4
Depth Subject Matter	44
General Program	
German 101.....	4
German 102 or 103.....	4
German 120.....	4
Three courses chosen from upper-division literature offerings taught in German..	12
Five additional upper-division courses selected from 104-109 and 121-198, upon the explicit advance approval of an undergraduate major adviser.....	20
The above category may be satisfied in part by substituting one or more courses in Comparative Literature, in another national literature, or from German literature-in-translation offerings (110-119) upon consultation with, and advance approval of, an undergraduate major adviser.	

German Area Studies Emphasis

German 101, 102 or 103.....	8
German 120.....	4
Three courses chosen from upper division literature courses that are taught in German.....	12
History 144.....	4
Four elective courses in accordance with student's interest.....	16
Courses chosen from at least two of the following three areas after consultation with and approval by adviser.	
Humanities: History 143, Philosophy 170, 175, 176.	
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 in issue.	
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.

Students are particularly encouraged to consider a minor that combines a coherent group of courses to emphasize area studies in German (i.e., German philosophy, the arts, history, political science, as well as literature). The purpose of the minor is to provide students with the opportunity to augment their training in other fields by acquiring proficiency in the German language and exposure to German literature and culture.

	UNITS
German Language	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 literature courses that are taught in German.....	18-24
One lower division course from German 48 to 52 may be counted.	

Major Advisers. C. Bernd, P. Schaeffer.

Honors and Honors Program. The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination. See also the University and College requirements.

Geophysics

(College of Letters and Science)

Geophysics is study of the physical properties and processes within and surrounding the Earth. Many problems in the Earth Sciences require geophysical techniques for study. The interdisciplinary minor in geophysics is designed for students with backgrounds in the physical sciences, engineering and other fields who are interested in pursuing a graduate or professional career in geophysics, or who require a significant knowledge in the field. The curriculum reflects the need for such students to have a

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 Advisers. G. Finney, H. Schneider

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 1/2-hour sessions. Introduction to German grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed German 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1H. Elementary Honors German (5) I, II, III. Henderson in charge

Lecture-discussion—5 hours. Prerequisite: overall high school GPA of 3.5 or GPA of 3.5 in German for students with prior knowledge of German. Accelerated and considerably expanded introduction to German language, short literary texts, and culture accompanied by computer-assisted grammar instruction. Material covered in courses 1H and 2H is the equivalent of that covered in courses 1, 2, and 3.

2. Elementary German (5) I, II, III. Henderson in charge

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in areas of grammar and basic language skills.

2H. Elementary Honors German (5) I, II, III. Henderson in charge

Lecture-discussion—5 hours. Prerequisite: completion of course 1H with minimum GPA of 3.3 or GPA of 3.5 for incoming students. Completion of the accelerated and expanded first-year program with special emphasis on four skills in a cultural context, literary texts, and computer-assisted grammar instruction.

3. Elementary German (5) I, II, III. Henderson in charge

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

4. Intermediate German (4) I, II, III. Henderson in charge

Recitation—3 hours. Prerequisite: course 3. (Course 4 may be taken concurrently with 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 four-course sequence (10-11-12-13) satisfies College of Letters and Science 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 course 10 on a P/NP grading basis only.

11H. 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. 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 (4) I. Hoermann

Lecture—3 hours; term paper. Knowledge of German not required. Reading in English translation from the Norse Eddas, the *Volsung* and *Sigurd-Siegfried* cycles, and the *Gudrun* lays; literary mythology in German Romanticism culminating in Wagner's "total artwork" concept and *The Ring of the Nibelungs* cycle. May not be counted toward major in German. General Education credit: Civilization and Culture/Introductory.

50. Survey of German Culture (3) II. Asman

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. Menges

Lecture—3 hours; discussion—1 hour. Knowledge of German not required. Introductory study of various genres of German literature with emphasis on the interrelationship between form and content and the impact on contemporary literary appreciation.

***52. Masterworks of German Literature in English Translation (4) I.** Fetzer, Finney

Lecture—3 hours; papers. Representative masterworks in English translation, beginning with the baroque period of the 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. Bernd

Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

100B. Advanced German Conversation (2) II. Asman

Discussion—2 hours. Prerequisite: course 4. Inten-

sive conversational practice, accurate pronunciation, and language fluency.

100C. Advanced German Conversation (2) III. Menges

Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

101. Composition and Conversation (4) I, II, III. The Staff

Discussion—3 hours; written reports. Prerequisite: course 4 or consent of instructor. Practice in short essay writing. Discussion based on readings from a variety of German texts.

102. Composition and Conversation (4) I, II, III. The Staff

Discussion—3 hours; written reports. Prerequisite: course 101 or consent of instructor. Practice in short essay writing with an aim toward refinement and expansion of vocabulary. Discussion based on readings in a variety of German texts.

103. Writing Skills in German (4) I, II, III. The Staff

Lecture—3 hours; term paper. Prerequisite: course 101. Practice in different kinds of writing, such as abstracts, correspondence, lecture summaries, analysis of or response to short literary texts.

104A. Translation (4) I. Jilling

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. Jilling

Discussion—3 hours; written reports. Prerequisite: course 104A or the equivalent. Exercises in German/English translation of literary and non-literary texts.

105. German Phonology-Morphology (4) I. Benware

Discussion—3 hours; written or oral report. Prerequisite: course 4; Linguistics 1 recommended. Modern German phonetics and the structure of the phonological system. Elementary morphological analysis.

106. History of the German Language (4) II. Benware

Discussion—3 hours; written reports. Prerequisite: course 102; course 105 or Linguistics 1 recommended. Survey of the development of the German language and study of its structure in historical perspective.

***107. Modern German Syntax (4) III.** Benware

Discussion—3 hours; term paper. Prerequisite: course 102 or the equivalent or consent of instructor; Linguistics 1 recommended. Examination of the major problems in describing modern German sentence structure.

***108. Varieties of Contemporary German (4) 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 preparation: any course from the GE Literature Preparation List.

111. Studies of Major Writers from the 17th to the 20th Century (In English) (4) III. Asman
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. Galer
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. Offered in alternate years.

***112. Special Topics in German Literature** (4) II. The Staff
Discussion—3 hours; written reports. Knowledge of German not required. Analysis of significant themes in German literature; women in literature; the image of America; 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. Schneider
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) I. Fetzer
Lecture—3 hours; term paper. Examines predecessors of Goethe's *Faust* (the German chapbook of 1587, Marlowe's *Tragical History of Dr. Faustus* of 1592), and some successors (Mann's novel of 1947) in order to underscore key variations of this provocative and pervasive theme. Knowledge of German not required. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: German 113.

115A. German Literature since 1945 (4) I. Menges
Lecture—3 hours; written reports—1 hour. Knowledge of German not required. Reading of major writers including the post-war generation of Austria, Switzerland and West Germany. Discussion of novelists like Böll, Grass, Johnson, Walsler, Handke; playwrights such as Frisch, Dürrenmatt and Hochhuth, and poets like Celan, Enzensberger, and Aichinger. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4C.

***115B. German Literature since 1945** (4) II. Kuhn
Lecture—3 hours; written reports—1 hour. Knowledge of German not required. Reading and discussion of the literature of the German Democratic Republic (East Germany), the theory of literature in the socialist world, the practice of this literature as exemplified in such authors as Strittmatter, Seghers, Wolf, Kant, Hacks.

116. From Goethe's *Werther* to Today's *Werthers (4) II. 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 preparation: German 52.

117A. The Tristan Tradition: Medieval, Musical, Modern (4) III. Fetzer
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 preparation: German 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: German 52 or any course from the GE Literature Preparation List.

***118A. Fin-de-siècle Vienna (The Swan Song of the Habsburg Empire)** (4) I. Kuhn
Lecture—1 hour; discussion—2 hours; term paper. Prerequisite: background in European history helpful (e.g., History 147B). Cultural ferment in Vienna, capital of the multinational Habsburg empire, at the turn of the century, with consideration of innovations in literature, music, graphic arts, architecture, philosophy, and psychology, heralding European modernism. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Comparative Literature 3 or History 4C; History 147B.

***118B. Weimar Culture: Defeat, the Roaring Twenties, the Rise of Nazism** (4) II. Kuhn
Lecture—1 hour; discussion—2 hours; term paper. Prerequisite: background in European history helpful (e.g., History 147B). Expressionism in graphic arts, literature, film, New Objectivity, Brecht, and Bauhaus considered in the context of the failure of the German experiment in democracy, the Weimar Republic of 1919-33. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Comparative Literature 3 or History 4C; History 147B.

***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. General Education credit: Civilization and Culture/Non-Introductory.

120. Survey of German Culture (4) III. Fetzer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history.

121. The Medieval Period in German Literature (4) I. McConnell
Discussion—3 hours; term paper. Prerequisite: course 101. Literary-philosophical profile of the *Mittelhochdeutsche Blütezeit* in terms of the significant epics, romances, and lyric poetry. Readings in modern German.

122A. Humanism and Reformation (4) I. Schaeffer
Lecture-discussion—3 hours; term paper. Prerequisite: course 101. Exemplary literary works of the sixteenth century tracing the principal lines of development and showing the reflection in literature of the social scene.

122B. The Literary Baroque (4) II. Schaeffer
Lecture-discussion—3 hours; term paper. Prerequisite: course 101. Exemplary literary works of the seventeenth century tracing the principal lines of development and showing the reflection in literature of the social scene.

123. Literature of the Classical Age (4) I. Schneider
Discussion—3 hours; term paper. Prerequisite: course 101. A critical assessment of principal works of Goethe and Schiller in their development from *Sturm und Drang* individualism and rebellion to the balanced harmony of the classical period.

***125. Short Fiction Around 1900** (4) II. Schaeffer
Lecture—3 hours; term paper. Prerequisite: course 101. Representative short German fiction in the fin-de-siècle period, to attain conversance with various prose styles and the cultural currents they reflect.

126. Modern German Literature (4) II. Menges
Discussion—3 hours; term paper. Prerequisite: course 101. Selections from the significant works of major twentieth-century writers, such as Hesse, Mann, Kafka, Rilke, Brecht, Grass. May be repeated for credit with consent of Undergraduate Major Adviser.

129. Postwar Women Writers (4) III. Finney
Discussion—3 hours; term paper. Prerequisite: course 101. Survey of major women writing in Germany since 1945. Considers such issues as the existence of "feminine writing" and of a feminist aesthetics. Writers include Seghers, Bachmann, Wolf, Kirsch, Morgner, Wohmann, Stefan, and Schwalger.

131. German Lyric Poetry (4) III. Schneider
Lecture—3 hours; term paper. Prerequisite: course 101. Study of the genre of lyric poetry from late Middle Ages through Renaissance, Baroque, Classical, Romantic, and Modern periods in correlation with other literary forms and the social climate of each period.

132. The German *Novelle* (4) I. Bernd
Lecture—3 hours; written reports. Prerequisite: course 101. Inquiry into the art of the "Novelle" through analysis of the materials and formal devices of representative authors from Goethe to Kafka.

***133. The German Drama** (4) III. Fetzer
Lecture—3 hours; term paper. Prerequisite: course 101. Readings in the works of Germany's leading dramatists from the seventeenth century to the present day, such as Lessing, Goethe, Schiller, Kleist, Hebbel, Hauptmann, Brecht.

***140. German Political Literature from the Middle Ages to the Present** (4) II. McConnell
Lecture—3 hours; discussion—1 hour. Prerequisite: English 3 or 4, or French 25; course 51 recommended. Examination of the relationship of art to politics in German literary history from the time of Walther von der Vogelweide in the Middle Ages, through the Reformation, the period of Romanticism, and the Twentieth Century. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: English 3 or 4. Offered in alternate years.

141. The Holocaust and its Literary Representation (4) I. Menges
Lecture—2 hours; discussion—1 hour; term paper. Knowledge of German not required. Aesthetic representation and metaphorical transformation of the holocaust in its human and historical perspectives. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE Preparation: any course from the GE Literature Preparation List.

142C. New German Cinema: From Oberhausen to the Present (4) I. Sammern
Lecture—3 hours; discussion—1 hour. A survey of representative works of the most influential filmmakers of the New German Cinema: Alexander Kluge, Volker Schlöndorff, Rainer Werner Fassbinder, Werner Herzog, Hans-Jürgen Syberberg, Wim Wenders, Margarethe von Trotta, Helke Sander, Helma Sanders-Brahms, and Jutta Brückner.

160. Love in the Middle Ages (4) I. McConnell
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Analysis of the phenomenon of love in

selected medieval lyrical poems and romances of the twelfth and thirteenth century *Blütezeit*. Origins of courtly love, love and individualism, love and the Church, love and adultery.

165. The German Epigram (4) I. Schaeffer
Lecture/discussion—3 hours; term paper. Prerequisite: course 101. Survey of the German epigram from its beginnings to the present, tracing the origins and development of the genre, its place in European literature, and its function as a mirror of the history of ideas.

176. The Kunstmärchen In German Literature (4) III. Hoermann

Lecture/discussion—3 hours; term paper. Prerequisite: course 101 and either 110 or 120; Comparative Literature 5 or 168A strongly recommended. Development of the literary "fairy," or magical, tale—beginning with Grimmelshausen and Goethe's epoch-making *Das Märchen*, focusing on Romanticism's poet figure as hero-messiah in the *Erlösungsmärchen* format, and ending with modern variants as in Hoffmannsthal, Kafka, and Brecht.

185. The Age of Bismarck (4) III. Bernd
Discussion—3 hours; term paper. Prerequisite: course 101. Study of notable literary repercussions that took place when Germany's international status reached its peak during the age of the Iron Chancellor. The poetry of Storm, the prose of Fontane, the drama of Hauptmann.

192. Field Work In German (1-12) I, II, III. Henderson
Internship—3-36 hours. Prerequisite: course 109A. Internship with several German companies. Participation in various business activities where expertise in German is expected and further developed. (P/NP grading only.)

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

200A. German Colloquium Series (2) I. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (Middle Ages to 1790), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

200B. German Colloquium Series (2) II. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (1790-1900), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

200C. German Colloquium Series (2) III. The Staff
Lecture/discussion—2 hours. A literary colloquium designed to help students prepare for the M.A. Examination. Review of texts based on the M.A. Reading List (1900 to present), including pertinent bibliographies and other research tools. Required of M.A. candidates. (S/U grading only.)

***202. Middle High German (4) II.** Benware
Discussion—3 hours; lecture—1 hour. Outline of grammar; selections from Middle High German epic, romance, and lyric poetry.

***210. Techniques of Literary Scholarship (4) I.** Fetzer
Seminar—3 hours; term paper. The bibliographical,

organizational, and methodological tools and resources for advanced, independent research.

211. Concepts in Literary Theory (4) II. Schneider
Seminar—3 hours; written reports. Advanced course in concepts of literary theory and criticism. Discussion of the emergence of theoretical concepts and their impact on the understanding and appreciation of literary works. Discussion in German and English, readings in German.

***212. Contemporary Approaches to Literary Theory (4) III.** Finney
Seminar—3 hours; term paper. Study of contemporary theoretical approaches such as structuralism, deconstruction, feminism, Marxism/Frankfurt School, and reception theory in conjunction with the works of major authors.

240. Forms of German Verse (4) II. Sammern-Frankenegg
Seminar—3 hours; term paper. The development of German verse from the Middle Ages to the present, with special emphasis on different techniques of text analysis and interpretation. May be repeated for credit with consent of instructor. Offered in alternate years.

***241. The German Drama (4) I.** Finney
Seminar—3 hours; term paper. The major forms of German drama from its origins to the middle of the twentieth century. May be repeated for credit with consent of instructor.

***242. The German Novelle (4) II.** Bernd
Seminar—3 hours; term paper. The major German *Novellisten*, with particular emphasis on the flowering of this genre in the nineteenth century. May be repeated for credit with consent of instructor.

***243. Fontane and the Rise of the Modern German Novel (4) II.** Bernd
Seminar—3 hours; term paper. Fontane, the father of the modern German novel and the chief German representative of the European novel at its greatest, in the context of the nineteenth-century European political and social scene.

***252. The Writings of Lessing (4) I.** Schneider
Seminar—3 hours; term paper. Study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama.

***253. Goethe (4) II.** The Staff
Seminar—3 hours; term paper. Study of the origins of Goethe's thought in German Pietism, and his principal artistic, autobiographical, scientific, and philosophical works.

***254. Schiller (4) III.** The Staff
Seminar—3 hours; term paper. A critical analysis of Schiller's major works and his impact on the intellectual climate in Germany during the late eighteenth and early nineteenth centuries.

255. Aesthetics in the Age of Goethe (4) I. Menges
Seminar—3 hours; term paper. Prerequisite: German 200A, 200B, 200C. Focuses on the emergence of aesthetic autonomy from eighteenth century normative poetics during the Age of Goethe. This involves the shift from a model based on the imitation of nature (and the Ancients) to a new concept grounded in the individuality of aesthetic experience. Offered in alternate years.

***257. Heinrich von Kleist (4) III.** Bernd
Seminar—3 hours; term paper. Kleist's important dramatic and prose works; special attention will be given to the peculiar hermeneutic problems in modern German, French, and Anglo-American Kleist criticism.

***258. The Novels of Thomas Mann (4) II.** Menges
Seminar—3 hours; term paper. Reading of selected novels with emphasis on aesthetic techniques, originality, ethical and political views, and influence on the contemporary literary scene in Germany.

259. Studies in Kafka (4) II. Hoermann
Seminar—3 hours; term paper. Study of Kafka's narrative techniques with special emphasis in the shorter works on the existential development from its roots in expressionism.

***260. The Poetry of Rilke (4) I.** Menges
Seminar—3 hours; term paper. Study of the principal

motifs, myths, images, and problems in the poetry of Rainer Maria Rilke.

261. Brecht and the Epic Theater (4) III. Menges
Seminar—3 hours; term paper. A reading of Brecht's works with emphasis on the ideas which impelled the development of new literary forms and concepts.

270A. Research in a Period or Topic (4) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; term paper. Individually guided research, under the supervision of a faculty member, in the specialized study of a period or problem that holds promise of yielding dissertation topics, culminating in a term paper. Recommended for Ph.D. candidates prior to the Qualifying Examination.

270B. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)
Individual instruction from a faculty member—1 hour. Prerequisite: course 270A. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

270C. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)
Individual instruction from a faculty member—1 hour. Prerequisite: course 270B. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

285. Middle High German Literature (4) III. McConnell
Seminar—3 hours; term paper. Prerequisite: course 202 or consent of instructor. Extensive reading of Middle High German texts in the original language. Examines linguistic and literary problems. May be repeated for credit with change of subject matter and consent of instructor.

***288. The Renaissance and Reformation In German Literature (4) I.** Schaeffer
Seminar—3 hours; term paper. The parabolic and didactic style in Germany's literature during the sixteenth century. May be repeated for credit with consent of instructor.

***289. German Literature of the Baroque (4) I.** Schaeffer
Seminar—3 hours; term paper. The "Elegantiaideal" and the varying methods used to portray it in seventeenth-century German literature. May be repeated for credit with consent of instructor.

290. The Enlightenment in German Literature (4) I. Schneider
Seminar—3 hours; term paper. Revolt against the concept of the "Elegantiaideal," and evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor.

***292. Sentimentality and "Sturm und Drang" in German Literature (4) III.** Menges
Seminar—3 hours; written reports. Reaction to overemphasis on Reason: theories of Hamann and Herder and works of poets such as Lenz, Leisewitz, the early Goethe and Schiller. May be repeated for credit with consent of instructor.

293. The Classical Age of German Literature (4) III. Asman
Seminar—3 hours; term paper. Inquiry into the aesthetic and humanistic qualities of Germany's greatest literary epoch. May be repeated for credit with consent of instructor.

***294. The Romantic Period in German Literature (4) III.** Fetzer
Seminar—3 hours; term paper. Survey of the works of early nineteenth-century authors in reaction against the age of classicism. May be repeated for credit with consent of instructor.

***295. Poetic Realism in German Literature (4) I.** Bernd
Seminar—3 hours; term paper. Outstanding figures in German literature between 1840 and 1890. Important phases in their developments will be treated. May be repeated for credit with consent of instructor.

***296. Twentieth-Century German Literature (4) I.**

Kuhn

Seminar—3 hours; term paper. Considers the revolt of the Hauptmann generation, symbolism, expressionism, and the chief currents of the contemporary scene. May be repeated for credit with consent of instructor.

297. Special Topics in German Literature (4) I, II, III.

The Staff

Seminar—3 hours; term paper. Various special topics in German literature, which may cut across the more usual period and genre rubrics. May be repeated for credit when topic differs.

298. Group Study (1-5) I, II, III.

The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Various special topics in German literature, which may cut across the more usual period and genre rubrics. May be repeated for credit when topic differs.

299. Individual Study (1-12) I, II, III.

The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Various special topics in German literature, which may cut across the more usual period and genre rubrics. May be repeated for credit when topic differs.

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III.

The Staff (Chairperson in charge)

Seminar—3 hours; term paper. Various special topics in German literature, which may cut across the more usual period and genre rubrics. May be repeated for credit when topic differs.

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 (1-3) I, II, III.

The Staff (Chairperson in charge)

Discussion—1-3 hours. Prerequisite: graduate standing. Apprentice training in ongoing undergraduate literature courses taught by regular staff, with supplementary weekly critique sessions; intern leadership of discussion sections under staff supervision. May be repeated for credit.

David Brody, Ph.D., Professor

Daniel R. Brower, Jr., Ph.D., Professor

Daniel H. Calhoun, Ph.D., Professor Emeritus

Robert O. Crummey, Ph.D., Professor

Betty Jo Teeter Dobbs, Ph.D., Professor

Paula E. Findlen, Ph.D., Assistant Professor

Manfred P. Fleischer, Ph.D., Professor Emeritus

Paul Goodman, Ph.D., Professor

William W. Hagen, Ph.D., Professor

Karen Halttunen, Ph.D., Professor

W. Turrentine Jackson, Ph.D., Professor Emeritus

David L. Jacobson, Ph.D., Professor

Phyllis G. Jestice, Ph.D., Assistant Professor

Earl H. Kinmonth, Ph.D., Professor

Catherine J. Kudlick, Ph.D., Assistant Professor

Norma B. Landau, Ph.D., Professor

Kwang-Ching Liu, Ph.D., Professor

Susan L. Mann, Ph.D., Professor

Roland Marchand, Ph.D., Professor

Ted W. Margadant, Ph.D., Professor

Barbara Metcalf, Ph.D., Professor

Rolie E. Poppino, Ph.D., Professor Emeritus

Don C. Price, Ph.D., Professor

Ruth E. Rosen, Ph.D., Professor

Morton Rothstein, Ph.D., Professor

Vicki L. Ruiz, Ph.D., Associate Professor

Richard N. Schwab, Ph.D., Professor Emeritus

Morgan B. Sherwood, Ph.D., Professor Emeritus

James H. Shideler, Ph.D., Professor Emeritus

Michael Smith, Ph.D., Associate Professor

Wilson Smith, Ph.D., Professor Emeritus

Stylianos Spyridakis, Ph.D., Professor

Clarence E. Walker, Ph.D., Professor

F. Roy Willis, Ph.D., Professor

The Major Program

The history major is designed to develop critical intelligence and to foster an understanding of ourselves and our world through the study of the past—both remote and recent.

The Program. A student electing a major in History may complete Plan I, 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.

Career Alternatives. A degree in history is excellent preparation for a professional career such as teaching, law, journalism, public administration, or business management. Professional schools in these and related fields are looking for students who can weigh conflicting evidence, evaluate alternative courses of action or divergent points of view, and express conclusions logically in everyday language. These analytical skills are stressed in many history classes, and their mastery gives the history student a solid preparation for subsequent training in a specialized career.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter20
(Plans I, II, and III)

Five lower division courses, including at least two from each of two of the following fields.....20

- Western Civilization: History 4A, 4B, 4C, 1, 2, 3, 10, 30
- Asian Civilization: History 8, 9A, 9B
- United States and Latin America: History 17A, 17B, 17C, 22, 72A, 72B, 85, 86
- Africa: History 15

Depth Subject Matter—Plan I.....40-41

At least six upper division courses from one of the fields of concentration* listed below. Include a two-quarter sequence of courses.....24

At least three upper division courses from one of the other fields listed.....12

At least one course from the following: History 101, or 102 (in field of concentration), 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 1015

History 102 in field of concentration5

History 103 in field of concentration4

Total Units for the Major, Plan II.....62

Depth Subject Matter—Plan III.....41

History 146A, 146B, 174B, 174C16

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, 187B, 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, 132, 133, 134A, 134B, 137A, 137B, 137C, 138, 140, 141, 142, 143, 144, 145, 146A, 146B, 147A, 147B, 147C, 148A, 148B, 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, 134A, 134B, 175B, 175C, 176A, 176B, 177A, 177B, 178, 179, 180A, 180B, 180C, 181, 183A, 183B, 185A, 185B, 187A, 187B, 188A, 188B, 189A, 189B, 189C.

c. Asian History: History 102G, 102H, 102N, 102Q, 102R, 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

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 (916-752-0776)

Faculty

Arnold J. Bauer, Ph.D., Professor

William M. Bowsky, Ph.D., Professor

Cynthia L. Brantley, Ph.D., Associate Professor

groupings include: Africa and Europe, Africa and Latin America, Africa and the United States. For other groupings, or to meet special needs, a student should obtain written approval from an adviser. Within broad fields, a student may wish to concentrate some of the courses on a particular area or period, such as China or Great Britain or Medieval Europe. Special approval is not required.

History and Philosophy of Science

The following courses count toward the History major and fulfill upper-division requirements in the European field:

History and Philosophy of Science 120, 130A.

The following courses fulfill upper-division requirements in either the U.S. or European field:

History and Philosophy of Science 130B, 150, 180.

Students may also repeat a major field in History of Science and Medieval History upon consultation with a faculty adviser. (History offerings in this area include: History 85, 86, 132, 135A-135B, 139A-139B, and 185A-185B.) Graduate seminars can be counted towards History Department degree requirements.

Consult the History and Philosophy of Science program for a more detailed description of course offerings in History and Philosophy of Science.

Major Advisers. C.L. Brantley, D.R. Brower, P.F. Findlen, D.L. Jacobson, P.G. Justice, E.H. Kinmonth, C.J. Kudlick, N.B. Landau, T.W. Margadant, B. Metcalf, D.C. Price, R.E. Rosen, M. Rothstein, V.L. Ruiz, M. Smith, S. Spyridakis, C.E. Walker, F.R. Willis.

Minor Program Requirements:

History units may be taken in a single field of concentration, such as Africa, East Asia, Europe, Latin America or the United States. Alternatively, students may select a minor with a thematic emphasis, as listed below, or design a thematic minor in consultation with a Department adviser.

UNITS

History20

At least 20 units of upper division history courses.....20

Examples of minor with thematic emphasis:

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, 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, 132, 133, 134A, 147A, 147B, 147C, 148A, 148B, 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 high or highest honors by meeting the minimum grade-point average and course requirements established by the College of Letters and Science. To qualify for highest honors, students must also complete the History Department honors program with a grade-point average of 3.5 or above in honors courses. Students will be invited to participate in the department honors

program during the latter part of their junior year on the basis of grade-point average, interviews, and faculty recommendations. They are required to complete the History 104A, 104B, 104C sequence of honors courses, which includes the completion of a senior honors thesis. Students who anticipate seeking admission to the honors program are urged to complete at least one History 102 (undergraduate proseminar) before the end of their junior year. They may follow any of the three plans for depth subject matter described above, and may substitute two of the History 104 courses for other upper-division courses (except History 102) normally required for depth subject matter under the plan.

Students who anticipate pursuing graduate work in history or a teaching credential, and who do not wish to opt for the research emphasis embodied in the honors program, are encouraged to select Plan II of the major.

Teaching Credential Subject Representative. 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 may easily be accommodated within the requirements for the major in History, but does require some specific course work. A list of current course requirements is available in the Advising Office, Division of Education, 174 Kerr Hall.

Education at Home Program (EHP). In the Winter Quarter of 1990, 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, 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.** 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. The Staff 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, II. 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. (CAN Hist Seq A)

4B. History of Western Civilization (4) II, III. The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance to the Eighteenth Century. General Education credit: Civilization and Culture/Introductory. (CAN Hist Seq A)

4C. History of Western Civilization (4) I, III. The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour. Development of Western Civilization from the Eighteenth Century to the present. General Education credit: Civilization and Culture/Introductory. (CAN Hist Seq A)

8. History of Indian Civilization (4) II. Metcalf

Lecture—3 hours; discussion—1 hour; written reports. Survey of Indian civilization from the rise of cities (ca. 2000 B.C.) to the present, emphasizing themes in religion, social and political organization, and art and literature that reflect cultural interaction and change. General Education credit: Civilization and Culture/Introductory.

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) II, III. 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, III. The Staff Lecture—3 hours; discussion—1 hour. Growth of the American people from Colonial times to 1815. General Education credit: Civilization and Culture/Introductory. (CAN Hist Seq B)

17B. History of the United States (4) I, II. The Staff Lecture—3 hours; discussion—1 hour. Growth of the American people from 1815 to 1915. General Education credit: Civilization and Culture/Introductory. (CAN Hist Seq B)

17C. History of the United States (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Growth of the American people from 1915 to the present. (CAN Hist Seq B)

***22. Violence and Law in America (4) III.** The Staff Lecture—2 hours; discussion—2 hours. Movements of protest or social control from the revolutionary period to the present.

***25. Thematic History Seminar (4) II.** The Staff Seminar—3 hours; term paper. Prerequisite: freshman or sophomore standing. Explores in-depth a historical topic related to the research interests of the instructor. Addresses historical questions, controversies, methodology, and interpretations.

***30. Russian Cultural History (4) I.** Crumney 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 preparation: History 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 preparation: History 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 revolutionaries, working class women, consumerism, the role of media, the "feminine mystique," changes in family life, and the emergent women's movement. General Education credit: Civilization and Culture/Introductory; Contemporary Societies/Introductory.

***85. Nature, Man, and the Machine in America (4) III.** The Staff

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.** The Staff

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.

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, X. Undergraduate Proseminar in History (5) I, II, III. The Staff

Seminar—3 hours; term paper. Designed primarily for history majors. Intensive reading, discussion, research, and writing in selected topics in the various fields of history. (A) Ancient; (B) Medieval; (C) Renaissance and Reformation; (D) Modern Europe to 1815; (E) Europe since 1815; (F) Russia; (G) China to 1800; (H) China since 1800; (I) Britain; (J) Latin America since 1810; (K) American History to 1787; (L) United States, 1787-1896; (M) United States since 1896; (N) Japan; (O) Africa; (P) Christianity and Culture in Europe, 50-1850; (Q) India; (R)

Muslim Societies; (X) Comparative History, selected topics in cultural, political, economic, and social history that deal comparatively with more than one geographic field. May be repeated for credit. Limited enrollment.

103. Topics in Historical Research (4) I, II, III. The Staff (Chairperson in charge)
Discussion—3 hours; individual consultation with instructor; term paper. Prerequisite: consent of instructor. Individual research resulting in a research paper on a specific topic in one of various fields of history. May be repeated for credit.

104A. Introduction to Historical Research and Interpretation (4) I. The Staff
Seminar—3 hours; term paper. Prerequisite: acceptance into History Department Honors Program. Directed reading and research aimed at preparing students to select appropriate topics and methodologies for a senior honors essay and to situate their topics within a meaningful, broad context of historical interpretations. Culminates in the submission of a full prospectus for an honors essay.

104B. Honors Tutorial (4) II. The Staff
Tutorial—4 hours. Prerequisite: course 104A. Research in preparation of a senior honors thesis under the direction of a faculty adviser. (Deferred grading only, pending completion of sequence.)

104C. Honors Tutorial (4) III. The Staff
Tutorial—4 hours. Prerequisite: course 104A and 104B. Completion of a senior honors thesis under the direction of a faculty adviser.

110. Themes in World History (4) II. Margadant and Metcalf

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; at least 8 units in history. Issues in world history from 1400 to the present. Topics will emphasize the interaction of diverse regions of the world as well as common patterns of historical change.

***111A. Ancient History (4) I.** Spyridakis
Lecture—3 hours; discussion or paper (student option). History of ancient empires of the Near East and of their historical legacy to the Western world.

111B. Ancient History (4) I. Spyridakis
Lecture—3 hours; discussion or paper (student option). Political, cultural and intellectual study of 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) I. 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 the 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) III. 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) I. 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.

125. Topics in Early Modern European History (4) III. Findlen
Laboratory/discussion—3 hours; term paper. Prerequisite: course 4B recommended. Social and cultural history, 1300-1800. Topics such as medieval and Renaissance Italy, early modern Italy, Ancien Regime France, family and sexuality, and material culture and daily life. May be repeated for credit.

130A. Christianity and Culture in Europe: 50-1450 (4) II. The Staff

Lecture—3 hours; written report or research paper. A history of the ideas and institutions of Christianity and their impact on the late Roman Empire and medieval Europe in terms of outlook on life, art, politics and economics.

***130B. Christianity and Culture in Europe: 1450-1600 (4) II.** The Staff

Lecture—3 hours; written report or research paper. A history of the Lutheran, Zwinglian-Calvinist, Radical, Anglican, and Catholic Reformations as foundation stones of a new culture in Europe, with special attention to the interconnections between the revival of antiquity and the different reform movements.

***130C. Christianity and Culture in Europe: 1600-1850 (4) III.** The Staff

Lecture—3 hours; written report or research paper. A survey of the intellectual, cultural and political reorientation of European society in the aftermath of the Wars of Religion. "Secularization" will be discussed in the context of the Enlightenment and Romanticism.

131A. Early Modern European History (4) I. The Staff

Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500.

131B. Early Modern European History (4) II. The Staff

Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650.

131C. Early Modern European History (4) III. The Staff

Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789.

***133. The Age of Ideas (4) II.**
Lecture—3 hours; written reports. The Enlightenment and its background in the seventeenth century.

134A. The Age of Revolution (4) II. The Staff
Lecture—3 hours; written reports. Ideas and institutions during the French Revolution and the Napoleonic era.

135A. History of Science to the 18th Century (4) II. Dobbs

Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Survey of the historical development of science, technology, and medicine from the ancient world to the eighteenth century, with special emphasis on Isaac Newton as the culmination of the seventeenth century scientific revolution.

135B. History of Science, 18th to 20th Centuries

(4) III. Dobbs
Lecture/discussion—3 hours; term paper. Prerequisite: upper division standing. Survey of the historical development of scientific thought in geology, biology, chemistry, physics, and cosmology from the eighteenth to the twentieth century, with special emphasis on emergence of broad explanatory principles that serve more than one science.

136. Scientific Revolution (4) III. Findlen

Lecture/discussion—3 hours; term paper. Prerequisite: course 135A or 135B recommended. History of science in Western Europe (1400-1750). Investigates the changing definitions of science in the age of Copernicus, Versallius, Harvey, Galileo and Newton. Considers the evolution of new ideas about nature, experiment, observation, and scientific theory.

***137A. Russian History: Kievan, Muscovite, and Petrine (4) I. Crumney**

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) II. 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 alternate years. General Education credit: Civilization and Culture/ Non-Introductory. Recommended GE preparation: History, 3, 4C, or 10.

139A. Medieval and Renaissance Medicine (4) III. Findlen

Laboratory-discussion—3 hours; term paper. The history of medicine, circa 1000-1700. Revival of ancient medicine; role of the universities; development of anatomy, chemistry and natural history; ideas about the body; cultural understanding of disease; hospital and the public health system. Offered in alternate years.

***139B. Medicine, Society, and Culture in Modern Europe (4) II. Kudlick**

Lecture—2 hours; discussion—1 hour; term paper. History of European medicine, 18th to 20th centuries, by examining the development of medical knowledge in epidemiology and anatomy; function of this knowledge, how it changed with technological breakthroughs and professionalization; and role of medicine in attitudes toward poverty, women, race, disease. Offered in alternate years.

***140. The Rise of Capitalism in Europe (4) III. Hagen**

Lecture—3 hours; term paper. Prerequisite: course 4B or 4C. Comparative analysis of major interpretations of the rise of merchant capitalism during the Middle Ages and Renaissance; European expansion overseas, 1450-1815; the transition to modern capitalism via industrial revolution. Interplay of social, political, cultural, and economic history. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A, 4B, or 4C.

***141. France Since 1815 (4) II. Margadant**

Lecture—3 hours; term paper. Prerequisite: course 4B or 4C. Comparative analysis of major interpretations of the rise of merchant capitalism during the Middle Ages and Renaissance; European expansion overseas, 1450-1815; the transition to modern capitalism via industrial revolution. Interplay of social, political, cultural, and economic history. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A, 4B, or 4C.

***142. Why the Holocaust? (4) II. Goodman**

Lecture—3 hours; term paper. Long- and short-term causes of the Holocaust; the emancipation of European Jewry; the rise of modern antisemitism; nationality question in central Europe; antisemitism and German politics; Nazism and mass murder; responses by victims and bystanders.

***143. History of Eastern Europe and the Balkans (4) 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 Habsburg and Ottoman Empires; nationalist movements, 1789-1914; the twentieth century, including an analysis of the contemporary scene.

***144. History of Germany since 1648 (4) II. Hagen**

Lecture—3 hours; essays. Social and political history of Germany in the ages of absolutism and the Enlightenment, industrialization and national unification, the World Wars, and since 1945.

***145. War and Revolution in Europe, 1789-1918 (4) 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. The Staff

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 preparation: History 4C or Philosophy 151.

147B. European Intellectual History, 1870-1920 (4) II. The Staff

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 preparation: History 4C or Philosophy 151.

147C. European Intellectual History, 1920-1970 (4) III. The Staff

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 preparation: History 4C.

148A. Women and Society in Europe: 1500-1789 (4) III. Kudlick

Lecture—3 hours; term paper. Prerequisite: course 4B recommended. Roles and perceptions of women from the Renaissance to the French Revolution. Emphasis on social and economic factors as well as on discussions of women in the writings of political theorists and social commentators.

148B. Women and Society in Europe: 1789-1920 (4) II. Kudlick

Lecture—3 hours; term paper. Prerequisite: course 4C, 148A recommended. Roles and perceptions of women from the French Revolution to World War I, primarily in France and England. Emphasis on social and economic developments within a loosely chronological and comparative framework.

***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 alternate 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. The Staff**

Lecture—3 hours; term paper. Prerequisite: courses 4A, 4B; course 151A recommended. From Lancaster and York to the Glorious Revolution. Includes growth of the Church of England; beginnings of modern worldwide economy; rise of the gentry and parliament; thought, arts, and literature in the times of More, Shakespeare, Hobbes, Wren, and Newton.

151C. Eighteenth-Century England (4) I. Landau
Lecture—3 hours; term paper. English history from the Glorious Revolution to the French Revolution. Examination of the transformation of one of Europe's most politically unstable kingdoms into the firmly established constitutional monarchy which provided an environment fit to engender the industrial revolution.

***151D. Industrial England (4) III. Landau**
Lecture—3 hours; term paper. English history from Waterloo to the Battle of Britain; the rise and continuance of the first industrial nation, examining the transformation of landed to class society, oligarchy to democracy and bureaucracy, Bentham to Bloomsbury, empire to commonwealth.

***154. Tudor and Stuart England (5) III. The Staff**
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. The Staff**

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. The Staff**

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.

161A. History of Colonial Spanish America (4) I. Bauer

Lecture/discussion—3 hours; written reports. Pre-Columbian civilizations of Middle America and the Andean region (mainly Aztec and Inca); the impact of European conquest and colonization; the formation of a hybrid culture. Extensive use of photographic slides. General Education credit: Civilization and Culture/Introductory.

161B. Latin American History (4) II. The Staff
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. The Staff**
Lecture—3 hours; written reports. The history of colonial and Imperial Brazil from 1500 to 1889. Offered in alternate years.

163B. History of Brazil (4) III. The Staff

Lecture—3 hours; written reports. The history of the Brazilian republic from 1889 to the present. Offered in alternate years.

***164. History of Chile (4) II.** Bauer

Lecture—3 hours; term paper. Prerequisite: course 161A, 161B, 165, or 168 recommended. Emphasis on the history of Chilean political economy from 1930 to the present. Various strategies of development (modernization, Marxism, Neo-Liberalism); the rise of mass politics; the course of foreign relations; and the richness of Chilean literature. Offered in alternate years.

165. Latin American Social Revolutions (4) I. The Staff

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 preparation: 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 alternate years.

***166B. History of Mexico Since 1848 (4) III.** The Staff

Lecture-discussion—3 hours; written and/or oral reports. History of Mexico from 1848 to the present. Offered in alternate years.

168W. History of Inter-American Relations (4) II. 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 preparation: History 17A or 17B.

169B. Mexican-American History (4) II. Ruiz

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 preparation: 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) III. 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.** The Staff

Lecture—3 hours. Political and social history of the American republic from the end of the War of 1812 to the Compromise of 1850.

171B. U.S. Civil War: Politics and Society (4) II. The Staff

Lecture-discussion—3 hours; term paper. Social crisis, 1848-1877: slavery and the West, new political parties, secession, mobilization and emancipation, economic nationalism and Reconstruction (for military aspects, see course 173).

***173A. North America: Early Imperial Wars (4) II.** The Staff

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 alternate years.

***173B. North America: Wars of National Expansion and Conservative Resistance (4) I.** The Staff

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 alternate years.

***173C. North America: Later Imperial Wars (4) III.** The Staff

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, III. 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) II. 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.** The Staff

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or the equivalent; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American thought from the Puritans through the era of the American Enlightenment. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4B or Philosophy 23.

***175B. Intellectual History of the United States (4) II.** The Staff

Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or a course in philosophy since the Renaissance, political theory, American literature, or sociological theory. Nineteenth-century American thought from the 1820s to about 1900, emphasizing Transcendentalism, Jacksonian democratic thought, the impact of Darwinism, and pragmatism.

***175C. Intellectual History of the United States (4) III.** ———

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. Haltunen

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.** Haltunen

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 preparation: 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 preparation: History 17A or 17B.

***178. American Colleges and Universities (4) III.** The Staff

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 alternate years.

***180A. Growth of American Politics to 1815 (4) I.** Goodman

Lecture—3 hours; extensive reading and supervised writing. The growth of American politics from the early settlements to 1815 focusing on the distribution of power, its change over time and the ways power has been used. Examines political party development and the social and ideological dimensions of political behavior.

180B. Growth of American Politics, 1815-1890 (4) II. Goodman

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A.

180C. Growth of American Politics, 1890 to the Present (4) III. Goodman

Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180B.

***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 associated with revivalism and the great awakenings and the movement from Protestant orthodoxy to pluralism in industrial America.

***183A. The Frontier Experience: Trans-Mississippi West (4) III.** The Staff

Lecture—3 hours; written and/or oral reports. The fur trade, western exploration and transportation, the Oregon Country, the Greater Southwest and the Mexican War, the Mormons, mining discovery, and the West during the Civil War.

***183B. The Frontier Experience: Trans-Mississippi West** (4) II. M. Smith

Lecture—3 hours; written and/or oral reports. Spread of the mining kingdom, the range cattle industry, Indian-military affairs, settlement of the Great Plains and Rocky Mountain Regions and political organization of the West.

***185A. History of Science in America** (4) II. The Staff

Lecture—3 hours; research paper. Survey of the European background. Study of American scientific institutions, ideas, personalities, creative processes in science, and of relationships between society and science from colonial times to present.

185B. History of Technology in America (4) I. M. Smith

Lecture—3 hours; research paper. Study of American technology, emphasizing biographical approach to historical understanding of technological change, creative processes, institutions, ideas, and relationships between technology and society from colonial times to present.

***187A. American Business History to the 1880s** (4) 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 alternate 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 alternate 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 alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 17A, 17B, or Agrarian Studies 2.

188B. History of Agriculture in the U.S. since 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 alternate years. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: History 17B, Agrarian Studies 2, Agricultural Economics 120, or Political Science 1.

***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 1920s; rise of organized labor; the automobile and moving picture industry; New Deal developments; changes with World War II; role of minorities; contemporary politics.

190A. Late Imperial China: Background to Revolution (4) I. Mann

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 alternate 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 alternate years.

190C. The Chinese Revolution (4) II. 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) III. 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 (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: enrollment dependent on availability of intern positions, with priority to History majors. Supervised internship and study as historian, archivist, curator, or in another history-related capacity, in an approved organization or institution. (P/NP grading only.)

193. History of the People's Republic of China, 1949 to the Present (4) III. Mann

Lecture—2 hours; discussion—1 hour; term paper. Comprehensive analysis of recent Chinese history, including land reform, the Cultural Revolution, the post-Mao era, and China's foreign relations from 1949 to the present. Offered in alternate years.

***194A. Aristocratic and Feudal Japan** (4) 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 alternate 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 alternate 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 alternate 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; written reports. Survey of cultural, social, economic, and political aspects of South Asian history from arrival of the British in the eighteenth century to formation of new independent states—India, Bangladesh, and Pakistan—in the twentieth century.

197T. Tutoring in History (2) 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-S. Sources and General Literature of History (4) I, II, III. The Staff

Seminar—3 hours; term paper. Designed primarily for students preparing for higher degrees in history. (A) Ancient; (B) Medieval; (C) Renaissance and Reformation; (D) Early Modern Europe; (E) Europe since 1815; (F) China to 1880; (G) China since 1880; (H) Britain; (I) Latin America since 1810; (J) American History to 1787; (K) United States, 1787-1896; (L) United States since 1896; (N) Modern Japan; (Q) Cross-Cultural Women's History; (S) History of Science and Medicine. May be repeated for credit when different subject area is studied.

202A-I. Major Issues in Historical Interpretation (4) I, II, III. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing. Fundamental issues and debates in the study of history. (A) Ancient; (B) Medieval Europe; (C) Modern Europe; (D) India; (E) Africa; (F) China; (G) Japan; (H) United States; (I) Latin America. Readings, papers, and class reports. May be repeated for credit when a 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.

***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 knowl-

edge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856.

***242. History of the Enlightenment (4) III.**
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) III. ———
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.

***273A-273B. Research Seminar in the Comparative History of Women and the Family (4-4) I-II.** Rosen

Seminar—3 hours; paper. Research in literature, methods, and historical approaches to the area of women and the family culminating in each student completing a research paper in this field. (Deferred grading only, pending completion of sequence.)

***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.

***279. History of the United States: the Twentieth Century (4) III.** Brody
Seminar—3 hours. Emphasis on social and economic developments.

291A-291B. Chinese History (4-4) II, III. Liu, Price
Seminar—3 hours; article-length paper. 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.

292. College Teaching Internship (4) I, II, III. Sherwood
Internship—4 hours. Prerequisite: course 300 (may be taken concurrently). Student prepares and teaches one lower division history course in a nearby community college under the supervision of a UC Davis instructor and a community college instructor. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300. Teaching History in the Community College (3) I. Sherwood

Discussion-laboratory—3 hours. Prerequisite: graduate standing. Designed for MAT students. Methods for the presentation of history at the community college and secondary school level. (S/U grading only.)

390. Teaching History in College (2) I, II, III. The Staff

Discussion—2 hours. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

History and Philosophy of Science

(College of Letters and Science)

James R. Griesemer, Ph.D., Program Director
Program Office, 409 Surge IV (916-752-9621)

Committee in Charge

Betty Jo T. Dobbs, Ph.D. (History)
Michael R. Dietrich, Ph.D. (Philosophy, History and Philosophy of Science)

Paula E. Findlen, Ph.D. (History)
James R. Griesemer, Ph.D. (Philosophy)
Michael Smith, Ph.D. (History)
Paul Teller, Ph.D. (Philosophy)

The interdisciplinary minor in the history and philosophy of science invites students to examine historical and contemporary problems in a variety of scientific disciplines, and to explore concepts and procedures basic to science and how they have evolved. The minor is sponsored by the Program in the History and Philosophy of Science. The faculty advisor is Professor Michael Dietrich, Department of Philosophy, 215 Surge IV, 916-752-3709.

Minor Program Requirements:

UNITS

History and Philosophy of Science24

Philosophy 1044

History 135A or 135B4

Four courses from those listed below. One course must be from each of three areas: *a.* history, *b.* philosophy, and *c.* history and philosophy of science16
a. History 102, 136, 139A, 139B, 185A, 185B, 188A, 188B;
b. Philosophy 106, 107, 108, 109, 110, 111;
c. History and Philosophy of Science 130A, 130B, 150, 180.

Courses in History and Philosophy of Science

Upper Division Courses

130A. From Natural History to the History of Nature (4) II. Findlen

Lecture/discussion—3 hours; term paper. Prerequisite: History 135 recommended. Evolution and demise of natural history as a discipline from Aristotle to Linnaeus. Considers ancient views of nature and its Renaissance rediscovery; the emergence of biology, botany, geology, and zoology; the history of taxonomy and classification.

130B. History of Modern Biology (4) III. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 130A recommended. Development of modern biology from pre-Darwinian roots to the present. Considers emergence of modern biological specialties and consolidation of biological theory around evolutionary ideas. History of allied fields such as genetics, paleontology, embryology, ecology, systematics and molecular biology.

150. Gender and Science (4) II. The Staff
Lecture/discussion—3 hours; term paper. An inter-

disciplinary approach to the relations between gender and science. Topics include the biological and cultural construction of sexual difference, the role of women as practitioners of science, and feminist approaches to science.

180. Topics in History and Philosophy of Science and Technology (1-4) I, II, III. The Staff

Lecture/discussion—1-3 hours; term paper. Prerequisite: consent of instructor. In-depth treatment of selected topics in the history and philosophy of science. Possible topics include: history of modern physics, history of molecular biology, science and society, scientific explanation, technology and culture, theory testing.

Graduate Courses

250. History and Philosophy of Science (4) III. The Staff

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Interdisciplinary seminar in the history and philosophy of science. Focuses on issues such as historiography, methodology, and the conceptual foundations of science. May be repeated for credit with consent of instructor.

Home Economics

(College of Agricultural and Environmental Sciences)

Program of Study

The Home Economics major is no longer available at UC Davis. If you have begun course work for this 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.

Courses in Home Economics

Lower Division Courses

***90. Challenges and Opportunities in Home Economics (1) III.**
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 alternate years.

92. Internship in Home Economics (1-12) I, II, III. The Staff
Internship—3-36 hours. Prerequisite: consent of instructor. Work 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
Internship—3-36 hours. Prerequisite: consent of instructor. Work 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
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Home Economics Education

See Agricultural Education

Horticulture (A Graduate Group)

David W. Burger, Ph.D., Chairperson of the Group
Group Office, 1035 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. The programs provide opportunities for specialized study of the production and management of horticultural plants and the post-harvest handling of horticultural commodities. Areas of specialization include: floriculture, nursery production, landscape horticulture, pomology, and viticulture. Research may be conducted on an applied or basic problem having physiological, nutritional, genetic, or ecological emphasis.

Preparation. A level of competence equivalent to that of a sound undergraduate program in Plant Science is required. This includes course work in general botany, chemistry, physics, statistics, genetics and introductory plant physiology. A few limited deficiencies in any of these areas can be made up after admission to the graduate program. Specific requirements are outlined in detail and may be obtained from the Group Office.

Graduate Advisers. Consult the Group Office.

Courses in Horticulture

Graduate Courses

251. Modeling Horticultural Systems (3) II. Lieth
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 101, calculus, or consent of instructor. Introduces students to systems modeling. Primary emphasis on physiological and ecological models with examples drawn from areas of interest to class participants. Applications to horticultural systems will be explored. Students will receive hands-on experience.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing at UCD. Seminars presented by invited speakers, students, or faculty on selected topics in horticulture. (S/U grading only.)

Human Anatomy

See Cell Biology and Human Anatomy in Medicine, School of

Human Development

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Applied Behavioral Sciences.

The Major Program

Human development explores 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 Program. Human development majors complete a group of preparatory courses in anthropology, biological sciences, genetics, nutrition, physiology, psy-

chology, statistics, and human development. Upper division students can design their programs in consultation with a faculty member to emphasize a particular interest. For instance, students can study the social and the biological aspects of human development while emphasizing child or adult development.

Internships and Career Alternatives. At least one practicum course is required. In addition, students can intern in schools, early childhood education centers, hospitals, rehabilitation centers, probation offices, group foster homes, mental health clinics, or as tutors for handicapped and bilingual students. Human development graduates fill a wide variety of positions in preschools, elementary and special educational settings, as well as governmental jobs related to social welfare and recreation. Those who emphasize the biological aspect of human development can apply to medical school or choose paramedical positions within the health sciences. Human development prepares students to pursue advanced degrees in the behavioral sciences, education, child guidance, social welfare, health sciences, or further research in human development. Graduate study is available through a Master of Science degree in child development, and a Ph.D. degree in human development.

B.S. Major Requirements:

(For convenience in program planning, the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	10-12
See College requirement	0-8
Additional English (choose from English 102, 103, 104).....	3-4
Preparatory Subject Matter	38-44
Anthropology 1, 2, and 15.....	13
Biological sciences (Biological Sciences 1A* or 10)†.....	4-5
Genetics (Genetics 10 or 100)†.....	4
Human development (Human Development 30).....	4
Nutrition (Nutrition 10 or 101).....	3-5
Physiology (Physiology 10 or 110 or Biological Sciences 1B*)†.....	3-5
Psychology (Psychology 1 or 15).....	3-4
Statistics (Education 114, Psychology 41, Sociology 46A and 46B, or Statistics 13).....	4
* <i>Chemistry 1A is recommended prerequisite for Biological Sciences 1A. Biological Sciences 1A is prerequisite for Biological Sciences 1B.</i>	
† <i>Taking the entire Biological Sciences 1A, 1B series will satisfy the Biological science, Genetics, and Physiology requirements.</i>	
Breadth/General Education	14-32
Satisfaction of General Education requirement	6-24
American history/American government (History 17A, 17B, 72A, 72B, and Political Science 1 are recommended courses).....	8
Depth Subject Matter	52
Human Development 100A, 100B, 100C, 110	16
Social-cultural processes (Human Development 102 or 103).....	4
Assessment (Human Development 120 or 121).....	4
Cognitive processes (Human Development 101 or 132).....	4
Exceptional children (Human Development 130 or 131).....	4
Practicum (Human Development 140-140L; or 141 or 142).....	4
Four additional upper division courses chosen from the Human Development courses or from a list of restricted elec-	

tives (in consultation with faculty adviser).....	16
Unrestricted Electives	40-67
Total Units for the Degree	180

Major Adviser. L.V. Harper.

Related Major Program. See the major in Applied Behavioral Sciences.

Minor Program Requirements:

	UNITS
Aging and Adult Development	21-27
Human Development 100C, 160, 191.....	8
Community Health 180.....	3
Human Development 110, Applied Behavioral Sciences 173.....	8
Practicum, 2 units minimum.....	2-8
Minor Adviser. L.V. Harper.	

	UNITS
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 AOB 4 (916-752-2244).

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. Socialization in families throughout the life cycle. Impact of alcoholism and abuse. Sources of strength and help. Not open for credit to students who have completed courses 100A, 100B, 110 and/or Psychology 112, 114, and 115. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Psychology 15-16.

19. Life Cycles, Kinship, and Growth in Human Populations (4) I. Carey
Lecture—3 hours; discussion—1 hour. Human populations at different levels of organization; including life course, family life cycle, race, ethnicity, genealogy, and population traits and changes. General Education credit: Nature and Environment/Introductory.

30. Observation Techniques in Human Development (4) I, III. Stockman
Lecture—3 hours; laboratory—3 hours. Prerequisite: Psychology 1 and consent of instructor. Observational techniques used in the study of human behavior and development, with focus on ages six months to five years; analysis and use of observational data. Students may not pre enroll for this course, but must sign up for laboratory time at the Early Childhood Laboratory prior to in-person enrollment.

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100A. Infancy and Early Childhood (4) I. Harper
Lecture—4 hours. Prerequisite: Psychology 1 or 15, Biological Sciences 1A or 10. Analysis of the biolog-

cal, social, and cultural influences in the psychological growth and development of children, prenatal through age six.

100B. Middle Childhood and Adolescence (4) II.

The Staff

Lecture—4 hours; three brief observations of school-age children. Prerequisite: course 100A or the equivalent; introductory biology. Analysis of the interplay of biological and social-cultural factors in the emotional, cognitive and social development from middle childhood through adolescence.

100C. Adulthood (4) III. The Staff

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses Psychology 1 or 15. Biological, cognitive and social psychological aspects of adult development.

101. Cognitive Development (4) II. The Staff

Lecture—4 hours. Prerequisite: courses 100A-100B or Psychology 112. Theories of cognitive development including developmental views of perception, learning, memory, concept formation, and language.

102. Social and Personality Development (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: Introductory psychology; course 100B or the equivalent. Theories of development of a child's personality through interactions with children and adults; development of interpersonal and culturally valued skills.

103. Cross-Cultural Study of Children (4) III. 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.

Chisholm

Lecture—4 hours. Prerequisite: Introductory psychology. Factors currently influencing American families including changing economic conditions, changing sex roles, divorce, and parenthood; theories and research on family interaction.

120. Research Methods in Human Development (4) I. The Staff

Lecture—3 hours; laboratory-discussion—1 hour. Prerequisite: courses 100A and 100B; elementary statistics. Research methods in selected areas of human development (i.e., infancy, learning, cognition, personality).

121. Psychological Assessment (4) I. The Staff; III. 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) I. Barton

Lecture—4 hours. Prerequisite: course 100A or consent of instructor. Mental retardation and special learning disabilities, etiology, diagnosis, education and socialization. Introduction to community resources.

132. Individual Differences in Giftedness (4) III.

Kraft

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. Stockman

Lecture—2 hours. Prerequisite: courses 30A, 100A, and 140L (may be taken concurrently) recommended. Theory and practice in the area of effective interaction with young children. Humanistic, child-centered approaches; awareness of goals, beliefs, and values as these affect interactions. Students may not pre-enroll for this course, but must sign up for laboratory time at the Early Childhood Laboratory prior to in-person enrollment.

140L. Laboratory in Early Childhood (3-6) I, II, III. Stockman

Discussion—1-3 hours; laboratory—6-12 hours. Prerequisite: course 140 (may be taken concurrently). Application of theories of learning and development to interaction with children six months to five years at Early Childhood Laboratory. Applied skills in communication, discipline and curriculum. May be repeated for credit for a total of 12 units.

141. Field Studies with Children and Adolescents (4-6) II, 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—1 1/2 hours; field study—6-12 hours. Prerequisite: consent of instructor and one course from courses 130, 131, or 132 (may be taken concurrently). Field study with children who are identified as developmentally disabled, emotionally distressed, or intellectually gifted. May be repeated for credit for a total of 12 units following consultation with and consent of instructor.

150. Supervision and Administration of Early Childhood Education Programs (4) I. 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.

151. Shared Child Care (4) II. Werner

Lecture—4 hours. Prerequisite: courses 100A or 110, Psychology 112, or Anthropology 131. Examines roles of caregivers other than parents in contemporary society, and the impact of grandparents, siblings, family day care providers, foster parents, church- and employer-sponsored child care on children's development. Reviews child care legislation and social policy issues.

160. Social Aspects of Aging (4) II. Aldwin

Lecture—4 hours. Prerequisite: course 100C or Psychology 115. How the social context affects adult development and aging. Emphasis on demography, social policy, culture, and adaptation. Oral histories as class projects.

***190C. Introductory Research Conference (1) I, II, III.** The Staff

Discussion—1 hour. Prerequisite: involvement in ongoing research. Instructors lead discussions with undergraduate students who involve themselves in a research project. Research papers are reviewed and aspects of project proposals developed out of class are presented and evaluated. May be repeated for credit. (P/NP grading only.)

191. Proseminar: Issues in Aging (2) I. The Staff
Seminar—2 hours. Prerequisite: upper division standing. Discussion of selected critical issues in aging.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: upper division standing and consent of instructor. Supervised internship off and on campus, in community, and institutional settings. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200A. Early Development (4) I. Harper

Lecture—3 hours; discussion—1 hour. Prerequisite:

graduate standing; basic biology/physiology; one upper division course in psychology or a related field; one upper division or graduate course in developmental psychology (may be taken concurrently). Theory and research on the biological, social, cognitive, and cultural aspects of development from conception to the age of five years.

200B. Middle Childhood and Adolescence (4) II.

Bryant

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 (3) III. Aldwin and Ober

Lecture/discussion—3 hour. Prerequisite: course 200A and 200B. Theory and research focusing on social, personality, cognitive, and biological development from early to late adulthood. Emphasis is on theory development and continuity and change.

***201. Social-Emotional Development in Infancy (4) II.** The Staff

Lecture-discussion—4 hours. Prerequisite: course 200A. Analysis of theory, methods, and research on social-emotional development in infancy. Emphasizes the development of primary and secondary emotions, and the development of attachment. Other possible topics include infant temperament, sex differences, compliance, and self-regulation.

***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 alternate years.

***210. Theories of Behavioral Development (3) III.**

The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in behavioral sciences. Consideration of enduring issues in theories of behavioral development; analysis of adequacy of major theoretical schools (e.g., social learning, Piagetian) as scientific theories. Offered in alternate years.

***211. Physiological Correlates of Behavioral Development (3) 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 subcultures in U.S.A.).

***217. Development of Cortical and Perceptual Laterality (3) II.** Kraft

Seminar—3 hours. Prerequisite: graduate standing in child or human development or consent of instructor. Current theory and research regarding the development of human cortical and perceptual laterality — emphasizing the relationship of this development to thinking and behavior.

220. Research Methods in Human Growth and Development (3) II. The Staff

Lecture—3 hours. Prerequisite: Statistics 13 or the

equivalent and at least two upper division courses in human biology or developmental psychology. Theory and research methods in biological growth, and cognitive and social/emotional development from prenatal period to death.

221. Psychological Assessment of Children (4) III. Barton

Lecture—2 hours; discussion—2 hours. Prerequisite: course 121 or consent of instructor. Study of children's behavior through examination, analysis and evaluation of perceptual-motor, cognitive, affective and social development. Problems in assessment of exceptional children considered. Assignments focus on preparation of a comprehensive report on one child.

***225. Behavioral Development and Food Intake (4) III.** Pollitt

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Human Development (and related fields) and Nutrition. Multidisciplinary view covering key theoretical and research issues in basic human development processes related to food intake.

***231. Issues in Cognitive and Linguistic Development (3) III.** Kraft

Seminar—3 hours. Prerequisite: consent of instructor. Study and evaluation of key issues in the theoretical and empirical literature on cognitive and linguistic development.

232. Cognition and Aging (3) I. Ober

Lecture/discussion—3 hours. Prerequisite: course 200C. The manner in which cognitive processes are affected by aging as well as an understanding of the changes in the central nervous system occurring with aging. Offered in alternate years.

***237. Parent-Child Interaction (3) III.** The Staff

Seminar—3 hours. Prerequisite: consent of instructor; upper division course on the family recommended. Current theory and research. Emphasis on parental behavior in other animals and other cultures, childrearing practices, the child's perception of parents, the differential influence of each parent on the child's psychological well-being, sex-role development, and moral development.

***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.

246. Sex, Evolution, and Development (4) I. Chisholm

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Human Development or related field. An evolutionary and cross-cultural perspective on the family, with special emphasis on life history theory and parental investment theory and their relevance for understanding the development of alternative mating and parenting strategies in humans.

290. Seminar (3) I, II, III. The Staff

Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter.

***290C. Research Conference (1) I, II, III.** The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Supervising instructors lead research discussions with their graduate students. Research papers are reviewed and project proposals are presented and evaluated. May be repeated for credit. (S/U grading only.)

291. Research Issues in Human Development (3) I. The Staff; II, Werner

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. Chisholm; 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 (916-752-1219)

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.)

Graduate Courses

250. Topics in Humanities (4) I, II, III. The Staff (Program Director in charge)

Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Topics in the humanities, selected by the instructor. May be repeated once for credit.

299. Individual Research (1-4) I, II, III. The Staff

(Program Director in charge)
Individual research in the humanities resulting in a formal written research report. (S/U grading only.)

Hydrologic Sciences (A Graduate Group)

Mark E. Grismer, Ph.D., Chairperson of the Group

Group Office, 113 Veihmeyer Hall
(916-752-3243/0453)

Faculty. The Group consists of faculty members

from the Departments of Civil Engineering; Environmental Studies; Geography; Geology; and Land, Air and Water Resources.

Graduate Study. The Graduate Group in Hydrologic Sciences is a unique interdisciplinary program offering M.S. and Ph.D. degrees. Education in the Group is designed to broaden the skills and knowledge of the physical science or engineering student interested in the occurrence, distribution, circulation and properties of water on earth. Because of water's ubiquity and importance to physical, chemical and biological processes, Hydrologic Science involves the geologic, atmospheric and oceanic sciences, as well as engineering and other applied physical sciences. Basic to the Hydrologic Sciences program is a core curriculum of courses in fluid dynamics, hydrologic phenomena, hydrogeochemistry, hydrologic techniques, and hydrologic policy. The program has three degree options including Water Resources, Groundwater Hydrology (Hydrogeology) and Hydrogeochemistry. Presently, only the option in Groundwater Hydrology is well defined. The remaining options are under development.

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 mathematics, applied statistics, and computer programming are recommended.

Specialization. Each student will pursue an individual program of advanced study under the direction of a group of faculty members with similar interests but diverse backgrounds. Course work in addition to the above is typically taken in the most appropriate departments.

Graduate Adviser. M.E. Grismer (Land, Air and Water Resources).

Graduate Courses

220. Numerical Modeling of Ground-Water Systems (3) III. Fogg

Lecture—3 hours. Prerequisite: Water Science 149A or Civil Engineering 144 and Water Science 149B, Mathematics 22B. Finite difference and finite element techniques in modeling ground-water flow and transport. Fundamentals of constructing and calibrating models with hands-on applications. Methods and limitations of numerical solution of transport equations. Model interpretation and ethics.

Immunology (A Graduate Group)

M. Eric Gershwin, M.D., Chairperson of the Group

Group Office, 3146 Medical Sciences-1A
(916-752-3392)

Faculty. The faculty includes members from several colleges and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Immunology is a multi-disciplinary group offering programs of study leading to the M.S. and Ph.D. degrees in various aspects of immunology. Possible areas of specialization include molecular biology, immunochemistry, immunogenetics, cellular immunology, clinical immunology, and tumor and developmental immunology.

Preparation. Applicants for candidacy to these programs should have completed undergraduate preparation in general biology, zoology or botany, general bacteriology or microbiology, general genetics, mathematics, general physics, chemistry, and biochemistry.

For work leading to the Ph.D. degree, the requirements include cell biology, chemical immunology,

cellular immunology, immunohematology, and advanced immunology. In addition to these general requirements more specialized preparation in at least one of the following is required: (a) microbiological specialties (bacteriology, virology, parasitology, medical microbiology); (b) zoological specialties (cell biology, endocrinology, embryology, protozoology, histology, cytology, physiology); (c) medical specialties (pathology, anatomy, pharmacology, clinical pathology, reproduction, hematology, epidemiology); (d) biochemistry/biophysics specialties (biologically active molecules, control mechanisms); (e) genetic specialties (developmental genetics, population genetics, cytogenetics, molecular genetics).

Graduate Adviser. Contact the Group Office.

Courses in Immunology

Graduate Course

292. Immunotoxicology Seminar (2) I. Golub Seminar—2 hours. Prerequisite: graduate standing. Seminar presentations dealing with principles of xenobiotic effects on immune system functions and specific examples of drugs and environmental chemicals exerting toxic effects on the immune system. Offered in alternate years. (S/U grading only.)

296. Advanced topics in Immunology (3) II. Cheung Seminar—3 hours. Prerequisite: graduate standing. Presentation, discussion and analysis of research topics in immunology, with emphasis on investigative bench research. (S/U grading only.)

Additional courses are available and listed under the Individual sponsoring departments. Contact the group office for information.

Independent Study Program

Information:

Chairperson
Committee on Courses of Instruction
c/o Academic Senate Office.
916-752-2231

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

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

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

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

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

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

Individual Major

(Colleges of Agricultural and Environmental Sciences and Letters and Science)

The Major Program

The Individual Major, an integrated program composed of courses from two or more disciplines, is designed by the student and is subject to approval by faculty advisers and appropriate college committees. This major enables a student to pursue a specific interest which cannot be accommodated within the framework of an existing major. It must clearly and specifically meet the student's educational goals as well as meet university and college academic standards.

Proposals for individual majors should be submitted *before the fourth quarter prior to graduation*. Specific requirements for each college are shown below. Application forms are available in program offices.

College of Agricultural and Environmental Sciences

Program Office, 122 Hoagland Hall (916-752-0610)

B.S. Major Requirements:

Preparatory Subject Matter(variable)
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.

Depth Subject Matter45
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 Letters and Science

Program Office, 150 Mrak Hall (Dean's Office), (916-752-0392)

Committee in Charge

Ed M. Bernauer, Ph.D. (*Physical Education*)
Robert D. Glauz, Ph.D. (*Mathematics*)
Robert M. Murphey, Ph.D., Chair (*Psychology*)
Peter M. Schaeffer, Ph.D. (*German and Russian*)

A.B. and B.S. Major Requirements:

Preparatory Subject Matter(variable)
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.

Depth Subject Matter45-54
Upper division units must include:
a. interrelated and complementary courses from two or more departments which provide a unified pattern and focus;

- b. at least 30 units from Letters and Science teaching departments or programs;
- c. no more than 10 units in courses numbered 194H, 198 and 199;
- d. for the A.B. degree, a maximum of 80 units toward the major; for the B.S. degree, a maximum of 110 units toward the major

Total Units for Degree180

Student Proposal. A student submits to the Dean's Office a major proposal and an essay, discussing educational purposes, personal and/or professional objectives, along with faculty letters of recommendation. After initial review, the Faculty Committee on Individual Majors evaluates the proposal and provides final action.

Major Advisers (selected by student). *Principal Adviser:* a faculty member in a teaching department or program in the College of Letters and Science in major field of emphasis. *Secondary Adviser:* a faculty member from secondary area of interest.

Honors Program. Toward the end of the junior year, students potentially eligible for high or highest honors at graduation (see College section), may petition the Individual Majors Committee for tentative acceptance into an honors program.

Final admission will depend upon the Committee's approval of a senior thesis prospectus that has been agreed upon by the student and faculty adviser. The prospectus must be presented to the Committee during the first quarter of the senior year. Graduation with high or highest honors will be conditional upon both the maintenance of the required grade-point average and the completion of the senior thesis project. Students who anticipate doing a senior honors thesis should allow up to 3 units of independent study in the program during each of the last quarters in the senior year as course options.

Integrated Studies

(College of Letters and Science)

Nora A. McGuinness, Ph.D., Program Director
Program Office, 816 Sproul Hall (916-752-3377)

Committee in Charge

Daniel R. Brower, Jr., Ph.D. (*History*)
Richard T. Curley, Ph.D. (*Anthropology*)
Kurt Kreith, Ph.D. (*Mathematics*)
Nora A. McGuinness, Ph.D. (*Integrated Studies*)
Jay Mechling, Ph.D. (*American Studies*)
Daniel L. Wick, Ph.D. (*Integrated Studies*)

Faculty

John Boe, Ph.D., Lecturer (*English*)
Thomas A. Cahill, Ph.D., Professor (*Physics*)
Richard T. Curley, Ph.D., Associate Professor (*Anthropology*)
Donald Gibbs, Ph.D., Associate Professor (*Chinese and Japanese*)
Bruce M. Hackett, Ph.D., Associate Professor (*Sociology*)
Jared Haynes, Ph.D., Lecturer (*Writing Center*)
Nora A. McGuinness, Ph.D., Lecturer (*Integrated Studies*)
Jay Mechling, Ph.D., Professor (*American Studies*)
Deborah Pittman, M.A., Lecturer (*Music*)
Ted W. Reid, Ph.D., Professor in Residence (*Ophthalmology*)
Mark Sanders, Ph.D., Lecturer (*Genetics*)
Eric Schroeder, Ph.D., Lecturer (*English*)
Kenneth L. Verosub, Ph.D., Professor (*Geology*)
Daniel L. Wick, Ph.D., Lecturer (*Integrated Studies*)

The Program of Study

Integrated Studies is an invitational freshman Honors residential program offering specially designed courses in humanities, natural sciences, and social

sciences. The program encourages cross-disciplinary interests in its faculty and students. It values close contact between student and professor both in the classroom and in the residence hall. Integrated Studies courses fulfill college breadth requirements and most of its courses fulfill the campus introductory General Education requirements. Enrollments are limited. (In 1991-92, 120 students will be admitted to the program. Class sizes are limited to 35.)

Students enroll in at least three Integrated Studies courses during the year. **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) III. Cahill

Lecture—2 hours; discussion—2 hours. Introductory course on the history, philosophy and methodology of physics from 600 B.C. to the present day. Changes in ideas about the physical universe explored. Problem solving not emphasized. General Education credit: Nature and Environment/Introductory.

*1B. Nature and the Environment: Origins of the Universe (4) I. Edlin

Lecture—3 hours; discussion—1 hour. Knowledge of the origins of the universe, of matter, of galaxies, stars, and planets, and of the earth and the variety of life forms that have evolved on this planet. General Education credit: Nature and Environment/Introductory.

1C. Nature and the Environment: Molecules to Humans (4) II. Reid

Lecture—3 hours; discussion—1 hour. Prerequisite: high school chemistry. Intended for liberal arts students. Integrates the principles of chemistry, biochemistry, genetics and molecular biology. Students are expected to achieve a fair scientific literacy in all of the subjects.

*2A. Civilization and Culture: Mathematics and Civilization (4) I. Kreith

Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Topics from arithmetic, geometry, algebra and probability presented in historical context which is designed to convey an appreciation of the role that mathematics has played in shaping our world and civilization.

*2B. Civilization and Culture: Theology (4) I. Robertson

Discussion—4 hours. Major issues in theology, including the existence and nature of God, the nature and destiny of the human species, free will, and morality from both a western and eastern perspective. General Education credit: Civilization and Culture/Introductory.

*2C. Civilization and Culture: Origins of Western Civilization (4) III. Rolier

Lecture—3 hours; discussion—1 hour. Civilizations of the ancient Near East and Greece: the problem of divine-human relations, problems of law and justice, and development of science and of logical thought. Readings include selections from Near Eastern texts and from Greek literature.

*2D. Civilization and Culture: Literature and Writing (4) I. McGuinness

Lecture—3 hours; small-group writing workshop. Prerequisite: completion of Subject A requirement. Exposure to basic methods of literary analysis in drama, fiction and poetry and concepts that guide literary scholars in making critical judgments. Formal writing training. General Education credit: Civilization and Culture/Introductory.

*2E. Civilization and Culture: Playing Shakespeare (4) III. Schroeder

Lecture—3 hours; laboratory—2 hours. Prerequisite: completion of Subject A requirement. Shakespeare as a theatre professional: producer, actor, director. His use and development of Elizabethan theatre acting space. Objective analysis of how Shakespeare's text actually works on stage. Scene exercises to illustrate effective playing of the text.

3A. Contemporary Societies: History in Our Time (4) II. Wick

Lecture—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

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.

*3D. Contemporary Societies: Speech, Privacy, and Conscience (4) II. Crockenberg

Discussion—4 hours. Analysis of the constitutional rights of speech, privacy, and conscience as limits on majoritarian decision-making. Specific topics to be covered include pornography, "hate" speech, broadcast codes, book censorship, sexual and associational privacy, abortion, and euthanasia. General Education credit: Contemporary Societies/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. General Education credit: Contemporary Societies/Introductory.

*8. Colloquium (1) I, II, III. The Staff (N. McGuinness in charge)

Discussion—1 hour. Lectures, films, and readings on the interrelation between the arts and sciences. May be repeated for credit. (P/NP grading only.)

8A. Special Topics in Natural Science and Mathematics (4) II, III. The Staff

Lecture—3 hours; discussion—1 hour. Group study of a special topic in natural sciences and mathematics. Course varies with topic offered. Limited enrollment. May be repeated for credit. General Education credit: Nature and Environment/Introductory.

8B. Special Topics in Humanities (4) I, II. The Staff

Lecture—3 hours; discussion—1 hour. Group study of a special topic in humanities. Course varies with topic offered. Limited enrollment. May be repeated for credit. General Education credit: Civilization and Culture/Introductory.

8C. Special Topics in the Social Sciences (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. Group study of a special topic in social sciences. Course varies with topic offered. Limited enrollment. May be repeated for credit. General Education credit: Contemporary Societies/Introductory.

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.)

International Agricultural Development

(College of Agricultural and Environmental Sciences)

The Major Program

The goal of international agricultural development is to improve food production, nutrition, marketing, and health in less technically advanced countries. Students in this major are trained in technical areas of agriculture that can be applied to the problems of world hunger and health.

The Program. International agricultural development majors may select their areas of technical specialization from any of the agricultural and environmental sciences, for example, agricultural economics, agricultural engineering, animal science, community development, food science, plant science, or resource science. Students interested in international work also need to develop the qualities necessary for effective performance in developing areas of the world. Courses in social sciences, humanities, and economics work toward this end by providing an understanding of the broad cultural, social, and economic environments in which agriculture operates in countries outside of the United States.

Career Alternatives. The study of international agricultural development prepares a student for a variety of careers. Some students choose service through the Peace Corps. Others seek employment in international trade, while others choose to work for a governmental or private agency in a foreign nation. Religious groups and organizations also employ university-trained individuals for agricultural work in conjunction with missions and other types of human service work overseas. The major is also preparation for further graduate work in agricultural development.

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement0-8
See College requirement

Preparatory Subject Matter42-48
(Choose either Social Sciences or Natural Science core)

Social Sciences core
Chemistry (Chemistry 10).....4
Science (Biological Sciences 10, Plant Science 2, Animal Science 1, Nutrition 10, Soil Science 10)15
Social sciences (Applied Behavioral Sciences 1, Anthropology 2, Political Science 2, Sociology 1, History 4C)16
Statistics (Agricultural Science and Management 150 or Statistics 13 or Sociology 46).....3-4

Natural Science core
Biological sciences (Animal Science 2, Biological Sciences 1A, 1B, 1C, Genetics 100, Plant Science 2)15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....16
Mathematics (Mathematics 16A or 21A).....3-4
Physics (Physics 6A)4
Statistics (Agricultural Science and Management 150 or Computer Science Engineering 10).....3

Breadth/General Education6-24
Satisfaction of General Education requirement

Depth Subject Matter39

Internal Medicine

See Medicine, School of

International Agricultural Development 10, 110	9
International agricultural development (International Agricultural Development 101, 102, 103, 141, 190, 191, 195, 198)	12
Economics and social sciences: Economics 1A-1B and two upper division courses relevant to development (Agricultural Economics 100A, 100B, 106, 113 or 136, 115A-115B, 140, 145, 147, 150, 176; Economics 100, 100M, 110A, 115A, 115B, 118; Anthropology 126, 131, 135; Applied Behavioral Science 153; Political Science 126, 146, 148A-148B; Sociology 144, 145)	18A

Primary Field of Specialization60

Natural Sciences or Social Sciences:

Courses chosen by student, with an adviser in that specialization, to include additional preparation required for a particular specialization, depth subject matter, and supporting disciplines.

Natural Sciences: Student should include some course work in social sciences appropriate to the geographic area of personal interest (e.g., anthropology, geography, history, or political science area studies courses).

Unrestricted Electives1-34

Students not possessing a reading/speaking ability in a foreign language will be encouraged to use these electives for language study or to attend an intensive language school.

Total Units for the Degree180

Specialization Advisers

A listing of faculty in the various areas of specialization and with interests in International Agricultural Development is available from the Major Adviser.

Major Adviser. S. B. Brush (*Applied Behavioral Sciences*).

Minor Program Requirements:

UNITS

International Agricultural Development20

International Agricultural Development 10, 101, 102, 110	16
Minimum of four units chosen from International Agricultural Development 103, 141, 190, 195, Economics 115A-115B, Vegetable Crops 150, Agronomy 100, 100L, 111	4

Minor Adviser. S. B. Brush (141 AOB 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 (*Agronomy and Range Science*); L.S. Jarvis (*Agricultural Economics*).

Related Courses. See Agricultural Economics 148, 215C; Agronomy 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 AOB 4 (916-752-2244).

Lower Division Courses

10. Introduction to International Agricultural Development (4) II. Brush

Lecture—3 hours; discussion—1 hour. Theories,

practices and institutions relating to agricultural development; the interaction of changing social, cultural and economic organization through successive stages of economic development; impact of new agricultural technology on underdeveloped regions. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Economics 1A-1B or Anthropology 2.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

Upper Division Courses

101. Tropical Crop Agriculture (4) II. Buddenhagen (Agronomy and Range Science)

Lecture—4 hours. Prerequisite: Plant Science 2 or Biological Sciences 1C, and Soil Science 100 or Agronomy 100. Environment and management factors affecting plant agriculture and farming systems in the tropics. Crops are considered in relation to shifting cultivation, rice-based cropping systems, annual cropping, polycropping and monoculture of perennial species.

102. Limited Resources Animal Agriculture (4) I. Brown (Animal Sciences)

Lecture—3 hours; laboratory—3 hours; field work—one Saturday. Prerequisite: Animal Science 2 or consent of instructor. Diverse production objectives of limited resource animal production systems in an environmentally and economically sound manner without compromising welfare of animals. Management theory, modeling, and practice in progressively more complex systems.

103. Social Change and Agricultural Development (4) III. Brush

Lecture-discussion—4 hours. Prerequisite: introductory social science course (Anthropology, Sociology, Economics, International Agricultural Development). How social and cultural factors influence technological change in agriculture; theories of diffusion of innovations; social impact analysis and technology assessment.

110. Agricultural Production Economics (4) I. The Staff

Lecture—4 hours. Prerequisite: upper division status and an introductory course in microeconomics (Economics 1A). Economic analysis of agricultural production in low income countries, from field-level data collection to national food policy. Emphasis is given to construction and use of farm models in project evaluation.

111. Agricultural Marketing Systems (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division status and an introductory course in microeconomics recommended (Economics 1A). Economic analysis of agricultural marketing systems in low income countries, including the functions of transportation, storage, packaging, handling, grading and standardization, processing, and market news. Emphasis is given to evaluation of interventions in marketing systems to speed economic development.

141. Technology for Agriculture in Developing Regions (3) I. Chancellor (Agricultural Engineering)
Lecture—2 hours; laboratory-discussion—2 hours. Prerequisite: Physics 1A; upper division standing. Equipment used in tropical agriculture. Man-, animal-, and engine-powered devices. Energy requirements, size-scale, costs, support infrastructure development, and productivity potentials. (Same course as Agricultural Engineering Technology 141.)

*190. Proseminar in International Agricultural Development (1) I, II. The Staff

Seminar—1 hour. Presentation and discussion of current topics in international agricultural development by visiting lecturers, staff and students. May be repeated for credit. (P/NP grading only.)

*191. Topics in International Agricultural Development (3) I, II, III. The Staff

Lecture/discussion—3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations—variable content. May be repeated for credit.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

195. Field Study in Agricultural Development (3) III. The Staff

Lecture—2 hours total; seminar—8 hours total; field work—overnight trips to sites in California (four two-day visits) or Mexico (one eight-day visit). Students will incur travel expenses. Observation of agricultural development strategies and impact on rural communities. Discussion with farmers, workers and organizational staff members. Study of farm commodities, institutions and experiences in dealing with agricultural development problems. International influence on United States agriculture. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

200. Analysis and Determinants of Cropping Systems (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101, Agricultural Science and Management 150 (or comparable statistics course). Cropping systems as a function of farmer objectives, resource availability, environment, and yield potential; interactions among management strategies, resource use efficiency, and the agroecosystem; stability, diversity, and sustainability of cropping systems.

201. The Economics of Small Farms and Farming Systems (4) II. Jarvis

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics 100A. Economic perspective on small farm development. Establishes a basis for predicting farmers' responses to changes in the economic environment, and for proposing government policies to increase small farm production and improve farmer and national welfare.

202. Social Systems and Agricultural Development (4) I. Orlove

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division course work in economic development, cultural anthropology, sociology, or political science (especially comparative politics or public administration), or consent of instructor. Social and cultural factors in agricultural and rural development; adaptation of rural people to development process; agrarian movements and revolution; evaluation of theories of rural development; application of social analysis to design and implementation of rural and agricultural policies and programs.

203. Management Systems for Agricultural Development (4) II. Wolf (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.

*220. Food and Nutrition Strategies in Developing Countries (3) II. Jarvis

Lecture—2 hours; discussion—1 hour. Prerequisite: Agricultural Economics 100A. Identifies important topical problems in food and nutrition policy, develops theoretical frameworks suitable for their analysis, examines the empirical information relevant to the problems and, using theory data, draws appropriate policy implications. Offered in alternate years.

290. Seminar in International Agricultural Development (1-2) I, II, III. The Staff Seminar—1-2 hours. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and issues in international agricultural development. (S/U grading only.)

***291. Topics in International Agricultural Development (3)** I, 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)

Steven R. Temple, Ph.D., Chairperson of the Group
Group Office, 103 AOB 4 (916-752-0770/1926)

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 international experience in development.

The philosophy guiding the program is that graduates must have strong preparation in a specific field within the agricultural and social sciences. Thirty different specializations are offered. In addition, to apply their specializations, graduates should be perceptive, and understanding of people in developing nations and have a comprehension of how technological, social, economic, and political variables affect the development process. They should have insight into individual and group motivations and be able to discern ways to initiate changes.

The program provides a multidisciplinary education designed to recognize these needs. It guides students to the knowledge, skills, and abilities needed to stimulate, assist, or manage agricultural development and enhance rural life in developing countries. Students are prepared to accomplish technological and biological improvement in agricultural methods and to encourage social innovations where appropriate.

Graduate Adviser. Contact the Group Office.

International Relations

(College of Letters and Science)

Miroslav Nincic, Ph.D., Program Director

Program Office, 351 Voorhies Hall (916-752-3063)

Committee in Charge

Donna L. Bahry, Ph.D. (*Political Science*)
Michael R. Caputo, Ph.D. (*Agricultural Economics*)
Dennis J. Dingemans, Ph.D. (*Geography*)
Michael J. Glennon, J.D. (*School of Law*)
Emily O. Goldman, Ph.D. (*Political Science*)
W. Eric Gustafson, Ph.D. (*Economics*)
Philip L. Martin, Ph.D. (*Agricultural Economics*)
Michèle Praeger, Ph.D. (*French*)
Elias H. Turna, Ph.D. (*Economics*)
Clarence E. Walker, Ph.D. (*History*)
Diane L. Wolf, Ph.D. (*Sociology*)

The Major Program

Problems of security, human rights, energy and mineral resources, and the environment are increasingly confronted at a global rather than a national level. With its theoretical models and real-world application, the study of international relations has become an exciting and highly relevant interdisciplinary major.

The Program. Graduation with a major in international relations requires completion of introductory courses in political science, economics, geography, and history. Upper division work is composed of a core of four courses in economics and political science required of all majors, and an additional set of eight courses chosen from one of four clusters which encompass major topical areas in combination with regional emphases: I. World Trade and Development, II. International Relations of the Third World, III. Global Resources and Environment, IV. World Politics. The major also requires fluency in English and a working knowledge (approximately 24 to 30 units of course credits or equivalent fluency) of one other modern language.

Programs, Internships, and Career Alternatives. One program of special interest to international relations majors is the Education Abroad Program, which provides insights into the life and culture of other countries. At UCD, the internship program assists students in obtaining legislative, legal, and business internships. In addition, the UC Davis Washington Center arranges summer internships in Washington, D.C. International relations graduates are prepared for employment in governmental agencies abroad (such as the Foreign Service), with state agencies, international or non-governmental organizations (such as the United Nations), foundations, and companies having interests in international business, trade, or finance. The stringent language requirement of the major program enhances career prospects in jobs which demand knowledge of the language and culture of other countries.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-55
Economics 1A, 1B	10
Political Science 3	4
Geography 10	3
History 4C	4
One course selected from Anthropology 2, Environmental Studies 30, Geography 2, History 4B, 9A, 9B, 10, 15, 17C, International Agricultural Development 10, Political Science 1, 2	3-4
Approximately 24 to 30 units (or the equivalent) in one modern foreign language	0-30
Recommended: one course in statistics (e.g., Sociology 46A, 46B, Statistics 13)	
Depth Subject Matter	48-50
Economics 115A or 115B	4
Economics 160A-160B (Cluster I) or 162 (Clusters II, III, IV)	4-8
(Cluster I students: note prerequisites for courses 160A-160B.)	
Political Science 123	4
Political Science 130	4
Cluster emphases	32

Choose one from the four clusters shown below. Courses must be in addition to those applied toward require-

ments above.

Total Units for the Major72-105

Course List for Cluster Emphasis

Cluster I: World Trade and Development (Heavy economic emphasis; suitable particularly for students who seek careers in international business or international organizations)

Economics 100
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, 145A

Two regional courses from Group A (History)

Cluster II: International Relations of the Third World
(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, 145A
Political Science 124, 126, 127, 128, 178
Economics 110B, 115A or 115B (whichever course is not used to fulfill the core requirement above), 116

Four regional courses focused on Third World:
Select two courses from Group A (History)
Select two courses from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster III: Global Resources and Environment
(Designed to familiarize students with major patterns of resource distribution in the world and the role resources play in international affairs)

Three courses to be selected from:
Agricultural Economics 147, 176
Economics 123
Environmental Studies 100, 101
Geography 160
Political Science 107
Resource Sciences 100

Two additional courses to be selected from two of the following groups:

Energy—Agricultural Economics 169, Geology 130, Political Science 171

Food Resources—Geography 142, 175, Sociology 144

Population—Sociology 170

Rural Development—Anthropology 126, 131, 133, 135

Urbanization—Anthropology 127, Geography 156, Sociology 143A, 145A

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 (His-
tory)

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, 196B (History 102 with advance
approval by faculty adviser; History 145, 146A,
and 146B may be offered only once toward the
major)

Regional Courses—Group B

Anthropology 131, 140A, 140B, 142, 144, 147, 148B,
149B

Economics 170, 171, 172, 173

Geography 122A, 122B, 123, 124, 125A, 125B, 126,
127

International Culture courses:

French 107, Portuguese 108A, Russian 130,
131

Political Science 131, 133, 134, 136, 137, 138, 141,
146, 148A, 148B, 148C, 149, (Political Science
129, 139, 179 with advance approval by faculty
adviser)

Sociology 147

Major Adviser. M. Nincic (*Political Science*).

Courses in International Relations

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 rela-
tions. 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). Prerequi-
site: upper division standing and consent of instruc-
tor. Work experience in international relations, with
term paper summarizing the practical experience of
the student. (P/NP grading only.)

194HA-194HB, **Special Study for Honors Students**
(4-4) II-III. Nincic and staff

Seminar—2 hours; term paper. Prerequisite: open
only to majors of senior standing who qualify for hon-
ors program. Directed reading, research, and writing
on topics selected by students and instructor culmi-
nating in preparation of a senior honors thesis under
direction of a faculty adviser. (Deferred grading only,
pending completion of course sequence.)

198. **Directed Group Study** (1-5) I, II, III.

Prerequisite: upper division standing and consent of
instructor. (P/NP grading only.)

199. **Special Study for Advanced Undergraduates**
(1-5) I, II, III

Prerequisite: upper division standing and consent of
instructor. (P/NP grading only.)

Internship

See Internship Program below;
also UC Davis Washington
Center

Internship Program

Lawrence B. Coleman, Ph.D., Director

The Internship and Career Center 2nd Floor, South
Hall (916-752-2855)

Program Areas

Agricultural and Environmental Sciences

Joe J. Stasulat, Program Manager

Education and Graduate Placement

Marg Lee, Coordinator

Kathi Shull, Coordinator

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

The Internship and Career Center facilitates a cam-
puswide 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 per-
taining to academic credit and Transcript Notation
may be directed to The Internship and Career Center.

Course Credit. Internship courses (numbered 92
and 192) are available for credit on a variable-unit
and Passed/Not Passed grading basis. A maximum
of 12 units of 92 and/or 192 courses may be counted
toward the 180-unit minimum needed for graduation.
To qualify for the 192 course, students must have
acquired 84 units of credit. All credited internships
require approval and sponsorship by a faculty mem-
ber from an appropriate discipline. Arrangements
may be made through the department of the spon-
soring faculty member and facilitated by The Inter-
ship and Career Center Staff.

Italian

(College of Letters and Science)

JoAnn Cannon, Ph.D., Program Director

Department Office (French and Italian), 516 Sproul
Hall (916-752-0830)

Faculty

JoAnn Cannon, Ph.D., Associate Professor

Dennis J. Dutschke, Ph.D., Professor; Director,

EAP—Padua, Italy

Gustavo Foscarini, M.A., Lecturer

Jullana Schiesari, Ph.D., 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 develop an appreciation for Italian language and
culture.

The Program. The Italian program is small and
geared to the individual needs of the student. The
use of Italian is stressed on all levels and a knowl-
edge of the language is required for literature cours-

es which are taught only in Italian. The Italian pro-
gram actively participates in the Education Abroad
Program, the International Internships Program, and
the Summer Sessions International (Naples), all of
which offer opportunities for travel and study in Italy.

Career Alternatives. Specific career opportunities
for those students who have a background in foreign
languages are abundant. In addition to the Foreign
Service, jobs are available in business and educa-
tion, 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 agri-
culture 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 lan-
guage.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-24
Italian 1, 2, 3, 4, 5, and 9 (or the equiva- lent)	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 Twenti- eth Centuries.	
A total of 8 units in literature may be replaced by Italian 107 (highly recom- mended) and/or by courses in related fields such as history, art history, and music.	
<i>Note: All upper division courses are to be chosen in consultation with the major adviser.</i>	
Total Units for the Major	36-60

Recommended

One year of college Latin or a Romance Language.

Major Adviser. G. Foscarini.

Minor Program Requirements:

	UNITS
Italian	20
Language, Italian 101 and either 102 or 104	8
Literature, three courses chosen in consul- tation 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 trans- lation 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 compre-
hensive 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: course 2. Continuation of grammar sequence, and practice of all language skills through cultural texts.

4. Intermediate Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 3 or the equivalent. Review of grammar and syntax through written exercises, and readings of short prose works. Intended to develop the linguistic foundations of students who have completed the first-year language classes.

5. Intermediate Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 4 or the equivalent. Review and study of grammar and syntax, readings of short prose works, and written exercises. Intended to prepare students to read, understand and discuss modern Italian.

8A. Italian Conversation (3) I, III. The Staff
Discussion—3 hours. Prerequisite: course 3 or the equivalent. Course designed to offer practice in speaking Italian. May be repeated once for credit. (P/NP grading only.)

8B. Italian Conversation (3) II. The Staff
Discussion—3 hours. Prerequisite: course 8A. Course designed to offer practice in speaking Italian. (P/NP grading only.)

9. Reading Italian (3) I, II, III. Director in charge
Lecture/discussion—3 hours. Prerequisite: course 5. Reading and discussion of modern Italian prose, including selections from creative, scientific and journalistic writings. Introduction to contemporary Italian literature and culture, as well as a means of strengthening the student's command of the Italian language.

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.

50. Studies In Italian Cinema (4) II. Cannon
Lecture—2 hours; discussion—1 hour; term paper. Introduction to Italian cinema through its genres. Focus is on cinema as a reflection of and a comment on modern Italian history. Film will be studied as an artistic medium and as a form of mass communication. General Education credit: Civilization and Culture/Introductory.

98. Directed Group Study (1-5) I, II. The Staff
Primarily intended for lower division students. (P/NP grading only.)

Upper Division Courses

101. Advanced Conversation, Composition, and Grammar (4) I. The Staff
Lecture—3 hours; weekly essays. Prerequisite: course 9 or consent of instructor.

102. Advanced Conversation, Composition, and Grammar (4) II. The Staff
Lecture—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—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.** The Staff

Lecture—3 hours; term paper or oral presentation. 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 his environment; (b) philosophical thought: the adversary evaluation of the concept of Man; (c) prose and poetry.

112. Medieval and Renaissance Poetry: St. Francis to Petrarch (4) I. Dutschke

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 9 or consent of instructor. Study of the origins of Italian religious and secular poetry of the 13th and 14th centuries. A diversified poetry is illustrated in works of St. Francis, Dante, Cavalcanti, Petrarch, the Sicilian School, the Sweet New Style Poets, and other authors.

113. Dante Alighieri, *Divina Commedia (Inferno, Purgatorio, Paradiso)* (4) III. Dutschke

Lecture—2 hours; discussion—1 hour; term paper—1 hour. Prerequisite: course 9 or consent of instructor. Study of Dante Alighieri's *Divina Commedia*, and its role in the development of Italian language and literature. Emphasis will be placed on reading the whole poem within the historical context of the Middle Ages.

114. Boccaccio, *Decameron*, and the Renaissance *Novella* (4) II. Dutschke

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 9 or consent of instructor. Study of the development of the short story in Italy, as exemplified in Giovanni Boccaccio's *Decameron*, in his predecessors and Renaissance followers.

***115A. Italian Literature of the Renaissance and the Baroque: from Humanism to Machiavelli (4) I.** The Staff

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.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: course 115A. Continued examination into the loss of an ideal. Emphasis on the conflicts in Michelangelo and Tasso leading to Marino, with an excursus on Galileo's role in the formation of a modern literary standard.

***118. Italian Literature of the Eighteenth Century (4) I.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Parini, Alfieri and Vico.

***119. Italian Literature of the Nineteenth Century (4) II.** The Staff

Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Romanticism in Italy, Manzoni, Verga, and *Verismo*.

120A. Italian Literature of the Twentieth Century: The Novel (4) III. Cannon

Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese, and Vittorini.

120B. Italian Literature of the Twentieth Century: Poetry and Drama (4) I. Cannon

Lecture/discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Italian poetry with emphasis on Hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama.

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.** Cannon

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.

140. Italian Literature In English Translation: Dante, *Divine Comedy* (4) I. Dutschke

Lecture/discussion—3 hours; term paper—1 hour. Prerequisite: any course from the GE Literature Preparation List. Reading of Dante Alighieri's *Divine Comedy*, through the otherworld realms of Inferno, Purgatory, and Paradise. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

142. Masterpieces of Modern Italian Narrative (4) III. Cannon

Lecture—1 1/2 hours; discussion—1 1/2 hours; term paper. Prerequisite: either English 3, Comparative Literature 2, or History 4C. Analysis of major works of Italian narrative fiction from unification of Italy to present. Students will learn to use representative methods and concepts which guide literary scholarship. Consideration of works within European social and cultural context. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: English 3, Comparative Literature 2, History 4C.

145. Special Topics in Italian Literature (4) I, II, III. The Staff (Director in charge)

Lecture—3 hours; discussion—1 hour. Prerequisite: course 9 or consent of instructor. Study of special topics and themes in Italian literature, such as comic literature, epic poetry, pre-twentieth century theater, fascism, futurism, women and literature, and the image of America, etc. May be repeated for credit when topic changes.

192. Italian Internship (1-12) I, II, III, IV. The Staff (Director in charge)

Internship—3-36 hours. Prerequisite: upper division standing and consent of chairperson of Italian Department. Participation in government and business activities to gain work experience and to develop a better knowledge of Italian language and culture. (P/NP grading only.)

194H. Special Study for Honors Students (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 (Director in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Japanese

See Chinese and Japanese

Land, Air and Water Resources

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(*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, hydrology, and water engineering. Teaching and research focus on both agricultural and environmental science. The faculty contribute to numerous other undergraduate and graduate programs in the Colleges of Letters and Science, Engineering, and Agricultural and Environmental Sciences.

Major Programs. Undergraduates in the department major in Atmospheric Science, Resource Sciences, and Soil and Water Science.

Advising Center is located in 122 Hoagland Hall (916-752-1669).

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

Landscape architecture is the planning and design of land areas where human use requires adaptation or conservation of the environment. Students who study landscape architecture are concerned about the welfare of the environment and the people who use it. They are capable of solving physical problems and are able to visualize and "think" in terms of spaces and three-dimensional concepts.

The Program. The curriculum balances creativity and visual and spatial skills with technological expertise and a thorough background in physical, natural, and social sciences. Students develop proficiency at problem-solving relating to design of parks, urban open spaces, energy-efficient neighborhoods, land reclamation projects, and landscape planning for wilderness and scenic regions, coastal and riparian environments, and other sensitive land areas. A process-oriented approach to design is stressed and environmental and community values are emphasized.

Preparatory Requirements. Students are admitted to the landscape architecture major only after submitting a portfolio for review and selection by the faculty. Contact the Environmental Design Advising Center or the Landscape Architecture major adviser for further information.

Career Alternatives. Graduates may find jobs in private landscape architectural firms or public agencies and corporations employing landscape architects. The landscape architecture major provides the student with excellent preparation for graduate school or career development in a wide range of environmental and design-related fields.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	50-58
Biological sciences (Biological Sciences 1A, 10).....	4-5
Biological Sciences 1C	5
Chemistry (Chemistry 1A, 10).....	4-5
Physics (Physics 1A, 5A, 10)	3-4
Two-dimensional design (Art 16, Design 21, Engineering 4)	3-4
Three-dimensional design (Art 5, 121A, 142, Design 134A-C, 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 plan-	

ning (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, Botany 117, Entomology 104, Zoology 114A, 114B, 125).....	3-5
Environmental awareness (Psychology 144).....	4
Related disciplines elective.....	4
Course to emphasize a discipline peripheral to landscape architecture (Environmental Biology and Management 110, 116, 122, 127, Environmental Studies 126, 161, 171, Agricultural Economics 18, Civil Engineering 1, Design 1)	
Unrestricted Electives	27-43
Total Units for the Major	180

Advising Center is located in 152 Walker Hall (916-752-1165).

Graduate Study. Refer to the Graduate Division section in this catalog.

Courses in Landscape Architecture

Lower Division Course

11. Landscape Studio: Introduction (4) II. The Staff
Studio—8 hours. Prerequisite: courses 21 and 40 (may be taken concurrently). Introductory studio problems in landscape architectural design equally emphasizing exposure to design arts, human factors, and natural resource planning. Emphasis is placed on functional and aesthetic considerations for small scale projects.

21. Landscape Drafting and Visualization (4) I. The Staff
Studio—8 hours. Prerequisite: course in free-hand drawing recommended. Development of idea expression through graphic media and the use of drawing instruments for visual representation including the methods of hand lettering, line quality, and perspective construction.

31. Landscape Construction: Introduction (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 11 and 40 (may be taken concurrently). Introductory analysis of materials and methods of technical landscape construction. Emphasis on structural, mechanical, electrical, functional, and aesthetic properties of materi-

als and construction methods commonly used in landscape development.

40. Introduction to Landscape Architecture (3) I, II. Schenker and staff
Lecture—3 hours. History, theory, philosophy, techniques and applications of landscape architecture and the analysis, planning, design, and management of outdoor spaces.

Upper Division Courses

111. Landscape Studio: Analysis, Function, and Process (4) I. Thayer and staff
Studio—8 hours. Prerequisite: course 11. Studio problems in the analysis of site and functional relationships relating to landscape development. Emphasis on inventory and analysis of natural and cultural site features, microclimate effects, pedestrian/bicycle/vehicular circulation, and basic social needs and uses of outdoor space.

112. Landscape Architecture Studio: Landscape Form, Design, and Art (4) II. Schenker and staff
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.

120. Computer Graphics for Landscape Architects (4) I. McNeil
Studio—8 hours. Prerequisite: course 21. Introduction to computer-aided design equipment and software applications, including computerized drafting, cut and fill calculations, road alignment, site engineering and landscape analysis.

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. The Staff
Studio—8 hours; two all-day field trips. Prerequisite: course 121. Open to Landscape Architecture majors only. Advanced concepts in multimedia and graphic presentation of landscape architecture projects, to include preparation of proposals, reports, audio-visual productions, and mixed-media presentations. Limited enrollment.

131. Landscape Architecture: Principles of Practice (3) I. The Staff
Lecture—3 hours. Prerequisite: course 31. Exposure to the legalities, expectations, and ethical standards of the profession of Landscape Architecture. Subject matter covers marketing, office management, liability, licensing, contracts and specifications, professional skills and project management.

132. Landscape Construction: Site Engineering (4) II. Owens and 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. McNeil, Schenker
Lecture—3 hours. History of landscape architecture as an art form, technology, and profession. Emphasizes design of gardens and outdoor spaces from prehistoric civilizations to the present. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Art 1A, 1B, or History 3.

155. Plants in the Cultural Environment (3) II, III. The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 10. Cultural parameters of selecting plants for use in environmental design and planning. Contemporary themes in climate, energy and resource conservation, low maintenance, aesthetics, edible landscapes, historic preservation, native plants, specialized gardens, and computerized plant selection. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10.

156. Landscape Planting Design (4) I. The Staff
Studio—8 hours. Prerequisite: course 111, 155, Environmental Horticulture 105. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans.

159. Public Garden Management (3) III. The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 1C, Plant Science 2, or Environmental Horticulture 6. Management of the collections, facilities and programs of public gardens. Emphasis is placed on the management skills and operational techniques utilized in public gardens.

181. Landscape Architecture Studio: Planning and Analysis (4) I. The Staff
Studio—8 hours; two all-day field trips. Prerequisite: course 113. Landscape architecture studio to include the solution of large-scale landscape architectural problems with emphasis on landscape planning and analysis methods and environmental concerns. Limited enrollment.

182. Landscape Architecture Studio: Urban and Community Design (4) II. Owens
Studio—8 hours; two all-day field trips. Prerequisite: course 181. Solution of community and urban landscape design problems with emphasis on community and social processes, participatory design methods, and comprehension of behavioral factors relating to urban open space. Limited enrollment.

183. Landscape Ecology (4) I. Dawson
Studio—8 hours. Prerequisite: course 113 and Environmental Studies 100 or consent of instructor. Practical exercises in ecological design emphasizing conservation, habitat restoration, cultural impacts, and bioregionalism. Emphasis is placed on management techniques, restorative methodology, and physical land use planning.

184. Sustainable Landscape Architecture (4) II. Thayer
Studio—8 hours. Prerequisite: course 113 or consent of instructor. Planning and design of land areas for social and environmental stability creating sustainable landscapes which conserve water, energy, arable soil, and biological diversity.

190. Proseminar in Landscape Architecture (1) I, II, III. Schenker, Dawson, Owens
Seminar—1 hour. Lectures and discussion of critical issues in landscape architecture. May be repeated three times for credit. (P/NP grading only.)

192. Internship in Landscape Architecture (1-12) I, II, III. The Staff

Internship. Prerequisite: senior standing in Landscape Architecture major. Professional field experience in landscape architecture. May be repeated for a total of 12 units. (P/NP grading only.)

193. Senior Project in Landscape Architecture (1-5) II, III. Dawson, Owens

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 (Master Adviser in charge)

Prerequisite: consent of instructor. Directed group study. (P/NP grading only.)

199. Special Study for Advanced Undergraduates in Landscape Architecture (1-5) I, II, III. The Staff (Master Adviser in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**201. Theory and Philosophy of the Designed Environment (4) III. Francis**

Seminar—4 hours. Prerequisite: course 140 or the equivalent; graduate standing or consent of instructor. Examines the major theories of environmental design. Epistemology of design serves as framework to examine modern landscape architecture, architecture, urban design and planning. Normative theories of design are reviewed along with the social and environmental sciences. Offered in alternate years.

***202. Methods in Design and Landscape Research (4) II. McNeil**

Seminar—4 hours. Prerequisite: Statistics 102 or the equivalent; graduate standing or consent of instructor. Explores many of the research and advanced design and planning methods employed in landscape architecture. Exercises provide the student with a vehicle for designing independent landscape research and creative activities. Lectures provide an historical overview of research methodology. Offered in alternate years.

203. Environmental Perception and Aesthetics (4) III. Thayer

Seminar—4 hours. Prerequisite: Psychology 144 or the equivalent; graduate standing or consent of instructor. Examines the perceptual and aesthetic response of humans to the physical environment and discusses the means by which intervention by design can affect human perception, cognition, aesthetic response, and, ultimately, human behavior. Offered in alternate years.

***204. Case Studies in Landscape Design and Research (4) II. Dawson**

Laboratory—8 hours. Prerequisite: contact department for prerequisite courses; graduate standing or consent of instructor. Case studies in landscape design and research have as their primary goal the exposure of the student to real-world, designed-environment situations where creative activity and/or basic research is the primary product. Offered in alternate years.

***210. Advanced Landscape Architecture Studio (4) III. The Staff**

Laboratory—8 hours. Prerequisite: course 113 or the equivalent; graduate standing or consent of instructor. Exposes students to real-world, designed-environment situations where creative activity and/or basic research is the primary product. Advanced landscape problems will be utilized at the site, urban or rural scale. Offered in alternate years.

***220. Public Space and Culture (3) III. Francis**
Seminar—3 hours. Prerequisite: course 182 or the equivalent; graduate standing or consent of instructor.

Explores the public environment of cities including their streets, parks, and squares. Public life and culture of American cities is examined and design responses to this culture evaluated. Typology is used to identify spaces. Offered in alternate years.

240. Rural Landscape Planning and Design (3) II. McNeil

Seminar—3 hours. Prerequisite: course 181 or the equivalent; graduate standing or consent of instructor. Addresses physical planning issues facing rural farmsteads, subdivisions, commercial zones, and small communities in their challenge of economic and social change. Concern is with runaway growth, shrinking populations, shifting economies, and lack of public funds or consensus. Offered in alternate years.

***250. Technology and Sustainable Landscape (3) III. The Staff**

Seminar—3 hours. Prerequisite: course 184 or the equivalent; graduate standing or consent of instructor. Explores the relationship between technology and landscape quality. Typology of technological landscape adaptations is presented and impacts of these technologies are discussed. Emphasizes a theoretical understanding of technological change and a practical approach to sustainable technologies. Offered in alternate years.

***280. Landscape Conservation (3) II. Dawson**

Seminar—3 hours. Prerequisite: contact department for prerequisite courses; graduate standing or consent of instructor. Focus is on land planning, design, and management techniques to further the goal of resource preservation. Examines current critical theory in the establishment and management of conservation areas. Offered in alternate years.

290. Graduate Seminar in Landscape Architecture (2) I, II, III. The Staff

Seminar—2 hours. Prerequisite: graduate standing and consent of instructor. Seminar on selected topics in landscape architecture research, analysis, planning, design, communication, or education. May be repeated for credit. (S/U grading only.)

297. Practicum in Landscape Architecture (1-10) I, II, III. The Staff

Independent study—1-10 hours. Prerequisite: graduate standing and consent of instructor. Opportunity for students to work directly in the field with academics at other institutions or with professionals in an office setting. Gives experience beyond the confines of campus and allows direct interaction with the community. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Directed Individual Research for Graduate Students (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Latin

See Classics

Law, School of

Ellen R. Jordan, J.D., Dean

Edward H. Rabin, LL.B., Associate Dean (Academic Affairs and Research)

Martha S. West, J.D., Associate Dean (Administration and Student Affairs)

Judy Janes, J.D., Acting Director (Law Library)

Dean's Office, 1011 Martin Luther King, Jr. Hall (916-752-0243)

Faculty

Homer G. Angelo, J.D., LL.M., Professor Emeritus

John D. Ayer, J.D., LL.M., Professor

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

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

Daniel Wm. Fessler, J.D., S.J.D., Professor

Barbara A. Fitzmaurice, J.D., Lecturer

Robert Fracchia, J.D., Lecturer

Arturo Gandara, J.D., Acting Professor

Michael J. Glennon, J.D., Professor

Gary Goodpaster, J.D., Professor

Sarah D. Gray, Ph.D., Professor (*Human Physiology*)

Robert W. Hillman, J.D., Professor

James E. Hogan, LL.B., Professor

Edward J. Imwinkelried, J.D., Professor

Leslie G. Jacobs, Lecturer

Ellen R. Jordan, J.D., Lecturer

Margaret Z. Johns, J.D., Professor and Director of Legal Writing

Kevin R. Johnson, J.D., Acting Professor

Friedrich K. Juenger, J.D., Professor

Evelyn L. Kirkland, J.D., Acting Professor

Leslie A. Kurtz, M.A., J.D., Professor

Cecilia D. Lannon, J.D., Lecturer

Pierre R. Loiseaux, LL.B., LL.M., Professor Emeritus

Arlene Mayerson, M.A., J.D., LL.M., Professor

John B. Oakley, J.D., Professor

E. Brad Nelson, J.D., Lecturer

Raymond I. Parnas, J.D., LL.M., S.J.D., Professor

Rex R. Perschbacher, J.D., Professor

John W. Poulos, J.D., Professor

Edward H. Rabin, LL.B., Professor

Mortimer D. Schwartz, J.D., LL.M., M.S., Professor Emeritus

Daniel L. Simmons, J.D., Professor

James F. Smith, J.D., Lecturer

Martha S. West, J.D., Professor

Sidney Wolinsky, LL.B., Lecturer

Bruce A. Wolk, 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. Love

Discussion—1 hour. Introduction to basic concepts of the law, the historical roots of common law and equity, the precedent system in its practical operation, the modes of reasoning used by courts and attorneys, and the fundamentals of statutory interpretation. (S/U grading only.)

201. Property (4) II. Dobris, Kirkland

Discussion—4 hours. Study of doctrines and concepts of property law with primary emphasis on real property. Course coverage includes the estates in land system, the landlord-tenant relationship, conveyancing, and private and public land use control.

202A-202B. Contracts (3-3) I-II. Ayer, Gandara

Discussion—3 hours. Course examines the sorts of promises that are enforced and the nature of protection given promissory obligations in both commercial and noncommercial transactions. Inquiry is made into the means by which traditional doctrine adjusts—or fails to adjust—to changing social demands. (Deferred grading only, pending completion of sequence.)

203. Civil Procedure (5) I. Hogan, Johnson, Oakley, Perschbacher

Discussion—5 hours. Study of the fundamental and

recurrent problems in civil actions including the methods used by federal and state courts to resolve civil disputes. Among the topics covered are the relation between federal and state courts; the power of courts over persons, property, and subject matter (jurisdiction); the scope of litigation (joinder of claims and parties); preparation for trial through pleading, discovery, and pretrial; devices for resolving actions and issues before and during trial; functions of judge and jury; and the finality of the trial court's disposition.

204A-204B. Torts (3-2) I-II. Brownstein, Kurtz, Juenger

Discussion—3-2 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.)

205. Constitutional Law I (4) I. Glennon, Poulos

Discussion—4 hours. 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 course 218, of procedural and substantive constitutional rights and the limits they place on governmental action. Economic substantive due process, procedural due process, and rights of privacy and personal autonomy will also be addressed.

206. Criminal Law (3) I. Goodpaster, Poulos

Discussion—3 hours. Study of the bases and limits of criminal liability. Coverage of the constitutional, statutory, and case law rules which define, limit, and provide defenses to individual liability for the major criminal offenses.

207. Legal Research (1) I. Bernhard

Discussion-laboratory—1 hour. Description of the variety of sources of law and secondary authority. Instruction in their location and use. Graded on basis of weekly self-teaching research drills. No final examination.

208. Legal Writing (2) II. Bernhard, Jacobs, 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
- (c) Business Law: 210, 213, 214, 215, 216, 228, 236, 237, 241, 243, 262, 269, 270, 274, 275
- (d) Constitutional Law: 217, 218, 288
- (e) Consumer Law: 224, 253
- (f) Criminal Law: 227, 239, 276, 284, 290
- (g) Estate Planning: 221, 223, 294
- (h) Family Law: 225, 230, 234, 272, 273, 281
- (i) International Comparative and Foreign Law: 233, 248, 249, 257, 266, 291
- (j) Labor Law: 251, 260, 271, 279
- (k) Procedure and Jurisdiction: 242, 246, 283, 295
- (l) Property and Environmental Law: 232, 256, 264, 265, 282, 285, 287, 295
- (m) Public Law: 231, 235, 261, 293
- (n) Skills and Litigation: 211, 219, 263A, 263B, 278, 297, 410A, 410B, 413, 414
- (o) Taxation: 220, 238, 245, 247, 254
- (p) Topical Survey Courses: 212, 226, 229, 240, 244, 252, 254, 266, 267, 268, 277, 280, 286, 289, 292, 296

- (q) Individual and Group Study: 298, 299, 416, 417, 418, 419
- (r) Clinical Programs: 420, 425, 440, 450, 455, 465, 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) II.**

Discussion—2 hours. Prerequisite: course 243 recommended. Focus is on businesses trying to survive when they are in substantial debt, exploring the structure of relief available under Chapter 11 of the Bankruptcy Code. Focus is on the goals of a troubled debtor and the strategies or options available to meet them.

211. Negotiation and Dispute Resolution (2) I, II.

Goodpaster

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. (S/U grading only.)

***212. Law, Medicine, and Ethics (2) I.**

Discussion—2 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) I. Fessler

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) II. Johnson

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 sole 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) I. Ayer

Discussion—3 hours. Prerequisite: course 243 recommended. Course covers security interests in personal property.

217. Constitutional Law I (3) I. Brownstein, Glennon, Poulos

Discussion—3 hours. This is a two-semester course. The first semester 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. Also begun is 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) I. Brownstein; II. Poulos

Discussion—3 hours. Course principally covers the First Amendment and the Equal Protection Clause. The First Amendment study involves an examination of freedom of speech and assembly, focusing on the various kinds of speech the courts have identified and their constitutional significance: political speech, commercial speech, offensive speech, obscenity, fighting words, and speech constituting a clear and present danger. Attention will also be directed to issues involving the forum in which speech occurs: prior restraint, overbreadth, vagueness doctrine, and the protection provided symbolic expression. The equal protection study will examine suspect class doctrine involving discrimination on the basis of race, gender, alienage, and other characteristics, affirmative action, the problem of "invidious motive," state action, and the extent to which the equal protection clause prevents government from burdening the exercises of fundamental rights. If time permits, the Establishment Clause and the Free Exercise Clause will also be considered.

219. Evidence (4) I. Imwinkelreid; 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. Kirkland

Discussion—3 hours. Study of the law of wills and trusts. Course coverage includes: Intestate succession; family protection and limits on the power of testation; execution, revocation and revival of wills; contracts to make wills; will substitutes; inter vivos and testamentary private trusts. Depending on the instructor the course may also cover one or more of the following topics: class gifts; powers of appointment; the Rule Against Perpetuities; and introduction to the administration of estates and trusts, including powers, duties, rights and liabilities of fiduciaries and the management of assets.

***222. Agricultural Law (3)**

Discussion—3 hours. Exportation and importation of agricultural products will be covered, including tariffs, quotas, and non-tariff barriers, the General Agreement on Tariffs and Trade (the GATT), United States trade legislation (escape clause, and antidumping and countervailing duties) and the General System of Preferences. The trading regimes of America's major agricultural trading partners, the European Community, Canada (the agricultural aspects of the Free Trade Agreement), and Mexico will be analyzed.

223. Estate Planning (2) I. 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.

***224. Consumer Transaction (3)**

Discussion—3 hours. Study of selected consumer law problems, including a survey of state and federal regulatory efforts. Course coverage may include the following: common law and statutory approaches to fraudulent or deceptive practices, disclosure of information, consumer credit regulation, equal credit opportunity legislation, quality standards, enforcement by the creditor, consumer remedies, and attorney fees for representing consumers.

225. Marital Property (3) I. Bernhard; II. Jacobs

Discussion—3 hours. The California community property system including rights of spouses and treatment of property during marriage; characterization, valuation, and division of property upon termination of marriage by dissolution, nullity, or death; and premarital contractual agreements. Also covered are nonmarital cohabitation, creditor's rights, and spousal support.

226. Mass Media Law (2) II. Kurtz

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. Parnas; II. Poulos

Discussion—3 hours. The police function: arrest, search and seizure, electronic surveillance, entrapment, police interrogation and confessions, lineups, the exclusionary rule, the role of counsel.

***228. Business Planning (3) II.**

Discussion—3 hours. Prerequisite: courses 220, and either courses 213 and 214 or course 215. Consideration of selected problems in business planning.

***229. Regulation of Foods, Drugs, Devices, and Cosmetics (2)**

Discussion—2 hours. Will examine FDA's elaborate regulatory framework for foods, drugs, devices, and cosmetics, and the impact of that regulation on products liability. Will analyze FDA regulation of the new products of biotechnology. Other current drug topics such as speeding the approval process for drugs to treat AIDS patients, creating exclusivity to encourage development of drugs to treat rare diseases, the generic drug scandal and prescription to OTC switches will be addressed. The adequacy of federal regulation to assure the safety of the food supply will also be covered with emphasis on developments in state law such as California's Proposition 65. Current food topics such as the marketing of foods with health claims will be visited. The practice of law in these pervasively regulated areas will be discussed.

***230. Family Law (Short Course) (2) I.**

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 overriding 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 overview, divorce, support, custody, and adoption confidentiality. (Conflict of laws and marital property not included.)

***231. Legislative Process (3) II.**

Discussion—3 hours. Course covers fundamental elements of the legislative process, including legislative procedure; the legislature as an institution; the legislative investigative power; lobbying; legislative-executive relations; and the legislature's constitutional powers and limitations.

232. Real Estate Finance (4) II. Rabin

Discussion—4 hours. Examination of the problems involved in the acquisition, financing and development of real estate and of lender remedies and debtor protections in the event of debtor default. Course strongly oriented toward current California law, and toward practical application of legal doctrines.

***233. International Human Rights (2)**

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. Lannon, Fitzmaurice
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) I. Gandara

Discussion—3 hours. Prerequisite: course 217. 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. The protection of individual rights, such as those of employees and recipients of governmental benefits, in the complex administrative state, and the regulation of particular industries, will also receive attention.

236. Securities Regulation I (2) I. Hillman

Discussion—2 hours. Prerequisite: courses 213 and 215, or consent of instructor. Principle focus of this course is the Securities Act of 1933. Topics covered include domestic and international public offerings, registration statements, exemptions from registration, secondary offerings, liabilities under the 1933 Act, express and implied causes of actions, the definition of a security, recapitalizations, and reorganization. Particular attention is devoted to problems of small issuers of securities.

238. Tax of Business Enterprise (4) I. Simmons

Discussion—4 hours. Prerequisite: course 220. The owners of partnerships and subchapter S corporations (pass-through entities) are taxed on items of income, deduction, and loss, as if the owner incurred the item directly. Corporations and shareholders are subject to income tax at both the entity and shareholder levels. This course examines the identity, organization, operation, and dissolution of pass-through entities in terms of the income tax impact of these transactions. Also examined are the formation, capitalization, operation, and liquidation of regular corporations subject to the double tax regime of subchapter C of the Internal Revenue Code.

***239. Sentencing Seminar (2)**

Seminar—2 hours. Consideration of sentencing goals, procedure, present alternatives, and suggested changes. Guests. Class presentation and required seminar paper.

***240. Law of Elections and Political Campaigns (2)**

Discussion—2 hours. Course covers constitutional, statutory, administrative and case law aspects of federal and state elections, including laws relating to primaries, general elections, initiatives, recalls, filing requirements, financial disclosures, and conflicts of interest.

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-Creditor (3) II. Ayer

Discussion—3 hours. Survey of the rights and obligations of debtors in trouble, and of their creditors. Most of it concerns proceedings under the Bankruptcy Code. In the first part of the course, an examina-

tion of how and why debtors are permitted to get a "fresh start," wiping out their obligations. Later, consideration of how the bankruptcy trustee collects and distributes money to pay creditors' claims. Study of the bankruptcy system as it applies to both individuals and corporations.

244. Basic Human Physiology (2) II. Gray

Discussion—2 hours. Several medical basic science faculty give lectures on the basic anatomy and physiological functioning of the organ systems; basic word roots which underlie medical/scientific terminology are emphasized. Several clinical faculty give lectures on new technologies in medicine and some of the associated legal problems which have arisen. Exams are in the format of simple, simulated medical-legal problems in which students are expected to evaluate medical/scientific data, as well as to determine the kinds of expert witnesses that might be valuable in particular cases. Limited to 25 students. (S/U grading only.)

***245. Estate and Gift Taxation (3)**

Discussion—3 hours. Prerequisite: course 220. Study of the federal taxation of gifts, trusts, and estates.

246. Federal Jurisdiction (3) 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. Advanced Federal Income Taxation of Business Enterprise (3) II. Simmons

Discussion—3 hours. Prerequisite: course 220 and 238. Continuation of course 238. Focuses on the federal income tax considerations involved in the transfer of business assets including corporate liquidation as an asset acquisition technique, corporate reorganizations, divisive reorganizations, and the transfer of corporate attributes in a reorganization transaction. Also examines tax planning for affiliated groups of corporations.

248. International Law (3) I. Glennon

Discussion—3 hours. Prerequisite: course 217 recommended. This introductory course covers basic international law concepts such as statehood and recognition; treaty law and customary international law; use of force; human rights and war crimes; expropriation; the relationships between international law and national law; and the jurisprudence of international law.

249. Comparative Law (2) II. Juenger

Discussion—2 hours. Comparison of methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in international transactions.

250. Jurisprudence (2) I. Oakley

Seminar—2 hours. Course considers the relationships between justice and law with special attention to the problem of how judges should decide hard cases where the content of the law is in doubt. To what extent should a judge's personal convictions about justice affect decisions about the legal rights of the parties to a law suit? Does it matter if the judge is interpreting precedent rather than legislation? Introductory readings of a general and synthetic nature will be followed by a sampling of philosophical essays analyzing particular problems of adjudication. Grading will be based on active class participation and on an original paper which meets the standards of the advanced legal writing requirement. Limited enrollment.

251. Labor Law (4) I. Bartosic

Discussion—4 hours. Survey of the legislative, administrative, and judicial regulation of labor relations. The course will focus on the historical development of labor law, the scope of national legislation, union organization and recognition, the negotiation and administration of collective bargaining agreements, the union's duty of fair representation, legality of strikes, picketing, boycotts, and employer interference with employee-concerted activities. Emphasis will be on law reform.

***252. Gender-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, educational opportunity, and criminal law.

253. Products Liability (3) I. Hogan

Discussion—3 hours. Civil action for harm to the consumer resulting from dangerous and defective products.

***254. Seminar in Legal History (2)**

Seminar—2 hours. Most students have only a haphazard exposure to the persons, events, and concepts that have shaped American law. Thus American lawyers do not share a common cultural heritage that would facilitate communication and shared values. In this seminar, each student would choose, in consultation with the instructor, a particular person, event, or concept to be the subject of his or her paper. Possible topics might include: a biography, together with representative opinions or briefs, of an outstanding lawyer or jurist; the historical background and effect of a key judicial decision or statute; the importance and effect of a particular development in legal education or legal theory. Each student will be required to prepare and present a paper that would fulfill the legal writing requirement. Each paper, together with its supporting documents, would be used as the nucleus of teaching materials that might be published for use in courses in legal history. Limited enrollment.

255. Pension Law (3) II. 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, spousal interests (both during marriage and after divorce), retiree health and welfare plans, and preemption of state law. Fiduciary problems will also be examined, particularly in the area of corporate takeovers and plan investments. Problems surrounding plan terminations will also be considered, including bankruptcy issues. Pension Benefit Guarantee Corporation insurance, and the issue of asset reversions to employers in the case of over-funded plans.

256. Land Use Planning (3) I. Kirkland

Discussion—3 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) II. Glennon

Discussion—3 hours. Prerequisite: course 217 or consent of instructor. Seminar covers subjects such as the war power, the treaty power and executive agreements, arms sales and military assistance, the recognition power, the negotiation power, the scope of the appropriations power as a check on executive activities, and other separation-of-powers issues generated by the intersection of international law and constitutional law. Class presentation and required seminar paper will satisfy the advanced legal writing requirement.

258. Professional Responsibility (1) I, II. Wydick

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) I. Wolinsky

Discussion—2 hours. Survey of legal issues involving the rights of disabled persons. (S/U grading only.)

260. Employment Discrimination (3) I. 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.

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. Imwinkelried; II. Fracchia

Discussion—2 hours; laboratory—2 hours. Prerequisite: course 219. Introduction to the preparation and trial of cases, featuring lectures, videotapes, demonstrations, assigned readings and forensic drills. Laboratory will be held on Tuesday, Wednesday, or Thursday evening. (S/U grading only.) Limited enrollment.

263B. Trial Practice II (2) II. Nelson

Discussion—2 hours. 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. Natural Resource Law (2) I. Dunning

Seminar—2 hours. An exploration of the origin, contemporary applications and potential of the public trust doctrine. This common law doctrine, long of significance with regard to the ownership and use of coastal lands, has recently also become very important for California water rights law. Many in the environmental community have suggested applications of the doctrine in other areas, e.g., wildlife and wilderness protection. Students will read materials on the public trust doctrine and on the closely related doctrine of state sovereign ownership and will prepare several short papers. There is no final examination. Class limited to 10 students.

***266. Wildlife Protection Law (2)**

Seminar—2 hours. Course will encompass federal and state laws directed at wildlife protection, as well as international norms. Required paper will satisfy the advanced legal writing requirement.

***267. Civil Rights Law (2)**

Discussion—2 hours. Surveys racial patterns in American law. May include the following: history of racial discrimination in public facilities, voting, the administration of criminal justice, public schools, housing, and employment. In addition, considers the remedies for racial discrimination, including actions under: 42 U.S.C.A.s 1981, 1982, 1983 and 1985; the Civil Rights Act of 1964; Title VI (programs receiving federal aid); Title VII (employment); the Voting Rights Act of 1965.

***268. Seminar in Jewish Law (2)**

Discussion—2 hours. The term "Jewish Law" refers to those subjects that would normally be taught in an American law school as they have been approached by the Jewish legal system. This system is based primarily on the Talmud and on the commentaries and decisions that are derived from it. Jewish law is of interest to American law students not for its immediate practical value, but because it is a foreign legal system that is one of the oldest in the world, and one that has faced many of the problems now facing American law. Specifically, although Jewish law is purportedly

based on immutable religious law, changing conditions over the centuries have encouraged methods of adaptation that are reminiscent of American constitutional law. Each student will be required to prepare and present a paper that would fulfill the advanced legal writing requirement. Neither a knowledge of foreign language nor a previous exposure to Jewish law is necessary. Limited enrollment.

***269. Corporate Finance (3)**

Discussion—3 hours. Focuses on how businesses raise money. Consists of two parts: a study of elementary "finance theory" and consideration of how this theory is applied by courts and legislatures.

270. International Business Transactions (2) II. Hillman

Discussion—2 hours. Consideration of selected problems in international business transactions.

271. Labor Law Seminar (2) II. Bartosic

Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Study of current questions from a critical legal studies perspective, including cases pending before the Supreme Court, 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 (codetermination, work councils, Japanese labor relations, and self-management and ownership). Emphasis will be on law reform. Satisfies advanced legal writing requirement. Limited enrollment: 12 students.

272. Family Law (Long Course) (3) II. Parnas

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)**

Seminar—2 hours. Prerequisite: course 225, course 230 or 272, or consent of instructor. Examination in depth of important current issues in the fields of family and marital property law. Heavy emphasis on law reform, including study and direct observation of the legislative process. Each student will select one issue for development and presentation in the seminar. A research paper or draft bill and supporting analysis is required. A more lengthy paper with additional unit credit may be arranged with consent of instructor to satisfy the legal writing requirement.

***274. Intellectual Property (3)**

Discussion—3 hours. Study of the protection of intellectual property and unfair competition. Among the topics considered are trade secrets, patents, trademarks, misleading and false advertising, and copyrights.

***275. Business Litigation (3)**

Discussion—3 hours. Focuses on issues that frequently arise in large, commercial litigation. The class will read and discuss materials, including case studies, raising issues of advanced civil procedure, including but not limited to the complexities of litigating class actions, the attorney-client privilege and work product doctrine, discovery and "discovery abuse," and the settlement of multi-defendant cases. Although many of these issues are touched on in the first-year civil procedure course, we will delve into them in greater detail and discuss some of the issues currently being litigated. The class will also discuss personal moral dilemmas that attorneys may face in representing corporate clients, such as the decisions attorneys in large law firms must make when assigned a case, or are asked by a client to take action, which, although legal, they believe to be morally objectionable.

***276. The Juvenile Justice Process (2)**

Discussion—2 hours. Legal and philosophical basis 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.

278. Pretrial Skills (3) I. Johns

Discussion—3 hours. Course uses a series of role-playing exercises and class discussions to introduce students to a set of non-trial skills basic to the practice of law. The course concentrates on client interviewing and counseling, but will also include exercises in witness interviewing, negotiation, drafting of pleadings, discovery plans, and discovery documents. It is an expanded version of the client counseling course. Limited enrollment.

279. Public Sector Labor Law (2) II. Bartosic

Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Application of private sector labor law doctrines to the public sector. Emphasis is on the four California public sector statutes and the impact of constitutional law on public employees. Class presentation and seminar paper will satisfy advanced legal writing requirement. Limited enrollment.

280. Advanced Legal Writing Seminar (2) II.

Wydyck

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)**

Discussion—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. Prerequisite: course 235. Introduction to regulation of the energy sector. Topics to be covered include regulation of natural monopolies, regulation of electricity and natural gas, legal aspects of the development of conventional and alternative energy sources, and international dimensions of energy development and regulation.

283. Remedies (3) I. Jacobs

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. Essential to those who wish to handle criminal cases. In particular, it treats bail, prosecutorial discretion, plea bargaining, trial by jury, and sentencing. Advanced legal writing requirement may be satisfied at the discretion of the instructor.

285. Environmental Law (3) I. Dunning

Discussion—3 hours. Introduction to the law dealing with environmental impact, particularly the National Environmental Policy Act, and to pollution control law. Particular emphasis is given to the Clean Water Act and various statutes on toxics in the environment. An introduction to the Clean Air Act is also provided.

***286. Law and Economics (2)**

Discussion—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.

***287. Public Land Law (3)**

Discussion—3 hours. Legal aspects of federal land management, including the history of public land law, authority over federal lands and specialized law dealing with particular natural resources and uses found on federal lands (mining, timber, range, wildlife, recreation and preservation). Limited enrollment: 12 students.

288. Advanced Constitutional Law Seminar (2) II.

Brownstein

Seminar—2 hours; paper. Explores in-depth selected topics or problems in constitutional law and theory. Topics may include public choice theory, the public-private distinction, community-based theories of constitutional order, theories of judicial review, theories of the First Amendment, the nature of constitutional law, rhetoric, etc. Problem areas may include separation of powers, freedom of speech, substantive due process, equal protection, affirmative action, and constitutional litigation. Satisfies advanced legal writing requirement. Limited enrollment.

289. Toxics Law (2) II. Dunning

Discussion—2 hours. Government efforts to regulate the release of toxic chemicals to the environment and to clean up existing toxic dump sites. "Toxic torts" — personal injury actions related to toxics in the environment — are included.

290. Criminal Justice Administration Seminar (2)

I. Parnas

Seminar—2 hours. 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) II.

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. Satisfies advanced legal writing requirement.

292. Immigration Law and Procedure (3) I. Smith

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. Public Interest Law Seminar (2)**

Seminar—2 hours. Examines various aspects of public interest litigation and practice. Includes a survey of legal techniques and problems common to public interest practice.

***294. Problems in Fiduciary Administration (2)**

Seminar—2 hours. Prerequisite: course 221. Select-

ed topics in the area of fiduciary administration of estates and trusts. Required class presentation and research paper will satisfy the advanced legal writing requirement. Limited enrollment.

295. Securities Regulation II (2) II. Hillman

Discussion—2 hours. Prerequisite: course 213 or 215, or consent of instructor; course 236 recommended. Principal focus is the Securities Exchange Act of 1934 and the regulation of securities markets. Topics include the evolution of securities markets, market efficiency, continuous reporting, institutional investors, shareholder voting and going-private transactions, regulation of securities markets and securities professionals, responsibilities of securities lawyers, transactional securities fraud, and enforcement of the securities acts.

296. Copyright and Entertainment Law (3) I. Kurtz

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 and characters, and the rights of privacy and publicity.

297. Client Interviewing and Counseling (2) II.

Smith

Discussion—2 hours. Course uses a series of role-playing exercises and class discussions to introduce students to a set of non-trial skills basic to the practice of law. Course concentrates on client interviewing and counseling but also includes exercises in witness interviewing, negotiation, and drafting of pleadings. Limited enrollment.

298. Group Study (1-4) I, II. The Staff

Groups of students (not fewer than 4 or more than 10) with common interest in studying a stated legal problem may plan and conduct their own research and seminar program, subject to the following regulations: (1) the program may extend over no more than two semesters; (2) the plan for the program and the list of members of the group must be submitted to Dean's Office at least 4 weeks prior to opening of the semester in which the program is to begin; (3) the three-member faculty board will be appointed for each group proposed and will have authority to approve or disapprove the program and the amount of credit sought; (4) changes in the program or in membership of the group must be approved by the faculty board and normally will be approved only prior to the semester involved; (5) group members must conduct a weekly seminar session to be arranged by them; (6) each member of the group must submit an individual paper or an approved alternative growing out of the seminar subject to the faculty board; (7) S/U grading basis only unless the entire group requests letter grades in advance.

299. Research in Legal Problems (1-4) I, II. The Staff

Students may receive credit for individual research projects, subject to the following regulations: (1) the project may extend over no more than two semesters; (2) each project will be under the supervision of a faculty member (normally, no faculty member will be permitted to supervise more than five students working on individual programs during any semester); (3) an outline of the project must be approved by the supervising faculty member in advance of the semester in which it is to be undertaken; (4) student must submit an individual paper or approved alternative to the supervising faculty member. (S/U grading only.)

Professional Courses**410A. Appellate Advocacy (Moot Court) (1) I.**

Program includes classroom instruction in appellate procedure and appellate advocacy skills and participation in the moot court program. Participants in 410A work on three oral advocacy problems and argue six times before a moot court. Both courses, 410A and 410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

410B. Appellate Advocacy (Moot Court) (1) II.
Prerequisite: course 410A. Continuation of course 410A. Participants in 410B research and write an appellate brief and argue the case twice before a moot court. Both courses, 410A and 410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

413. Interschool Competition (1-3) I, II. The Staff
Prerequisite: consent of appropriate faculty adviser. Participation in interschool moot court and lawyering skills competitions. Enrollment is limited to students actually representing the School in the interschool competitions. Competition must be authorized by the appropriate faculty adviser. The faculty adviser may condition the award of academic credit for any particular competition on the performance of such additional work as may be reasonable to justify the credit. May satisfy advanced legal writing requirement. (S/U grading only.)

414. Moot Court Board (1) I, II. The Staff
Prerequisite: course 410A-410B. Members of Moot Court Board may receive one credit for each semester of service on the board, up to maximum of two. Credit awarded only after certification by Moot Court Board and approval of the faculty advisers to Moot Court Board. Limited enrollment. (S/U grading only.)

415. Trial Practice Honors Board (1) II.
Members of the Trial Practice Honors Board administer the Trial Practice II course. Students may receive one credit for service on the Board. Credit is awarded upon approval of faculty adviser. (S/U grading only.)

416. Law Review Writer (1-2) I and/or II.
Writing of an editorship quality law review article under the editorial supervision of editors of the *Law Review*. Minimum of 40 hours contribution to the *Review's* publication is also required. Credit may be obtained only upon achieving status as a member of the *Law Review*, which requires that the student have made substantial progress toward completing an editorship article. Credit is awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the *Law Review*. One unit of credit is earned the first semester. Two units are earned the second semester upon completing an editorship draft. One unit is earned second semester if only a membership draft is completed. (S/U grading only.)

417. Law Review Editor (2) I, II. The Staff
Editors must have completed an editorship article and must perform editorial duties requiring a substantial time commitment. Credit 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

Discussion—2-12 hours. 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. Minimum units for the course are 4 and maximum is 12. Each unit assumes four hours work per week, including participation in the seminar, conference, and case research and development. Students who have completed course 292 may take the clinic for a minimum of 2 units. Limited enrollment. (S/U grading only.)

450. Clinical Program in Environmental Law (2-6) I. 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. Bartosic

Clinical Program. Prerequisite: prior or concurrent enrollment in course 251 or 260 or consent of instructor. Practical experience in employment relations: private and public sector labor law, or employment discrimination. Students will work under the direct supervision of a government or private lawyer and will have the opportunity to participate in a range of activities associated with their specific office, with emphasis on observation and participation in actual investigation, interviewing, drafting of pleadings, and attendance at hearings. Weekly journals and attendance at monthly small group meetings required. (S/U grading only.)

465. Clinical Program in Administrative Law (2-6) I, II. Gandara

Clinic—2-6 hours. Prerequisite: course 235 (may be taken concurrently) or consent of instructor. For students interested in a work experience in an administrative law setting. Students will work under the direct

supervision of an administrative law judge, hearing officer, or government attorney. Placement assistance will be provided by the instructor. A goal of this clinical will be a breadth of experience in the areas of formal adjudication, informal adjudication, rulemaking, and judicial review. Students will be required to meet monthly as a group to share experiences and maintain observational journals. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (2-12) I, II. The Staff
Clinical program. Prerequisite: courses 219, 227 and 263A recommended. This program affords students the opportunity to gain practical experience working full- or part-time in a District Attorney's or Public Defender's office in one of several surrounding counties for a minimum of 13 office hours per week. Students enrolled in the program engage in the full range of activities associated with their specific office with emphasis on observation and participation in factual investigation, interviewing, counseling, negotiating, motion practice, and trials under State Bar rules. Journals and seminar attendance are required. Limited enrollment. May be repeated for a total of 12 units. (S/U grading only.)

480. Clinical Program in Prison Law (2-6) I, II.
Clinical Program. Provides practical experience in providing legal services to real clients who have various problems related to their incarceration in state prison. The services require analysis and application of Constitutional Law, state statutory law, agency regulations, and the rules of professional responsibility. Students will work under the direct supervision of the Prison Law clinical director and will be assigned a portion of the director's case load. Students will be required to follow the law office procedure of the clinic and employ skills such as interviewing, research, writing, negotiating, and possibly, the preparation of legal documents to be filed in court. (S/U grading only.)

495. Instruction in Legal Research and Writing Skills (1-2) I. Bernhard; II. Bernhard, Jacobs, Johns
Participants will assist in instructing legal research and writing for first-year students under the direction of the legal research and writing instructors. Approval of the research and writing instructors is required for enrollment. Participants may assist once in the legal research program and once in the legal writing program. One unit will be given in the fall semester for legal research instruction and two units in the spring for legal writing instruction. (S/U grading only.)

Linguistics

(College of Letters and Science)

———, Program Director

Program Office, 922 Sproul Hall (916-752-9933)

Committee in Charge

Wilbur A. Benware, Ph.D. (*German*)

Diane Brentari, Ph.D. (*Linguistics*)

Patrick Farrell, M.A. (*Linguistics*)

Caroline Henton, D.Phil. (*Linguistics*)

María I. Manea-Manoliu, Ph.D. (*French*)

Almerindo E. Ojeda, Ph.D. (*Linguistics*)

Lenora A. Timm, Ph.D. (*Linguistics*)

Maximo Torreblanca, Ph.D. (*Linguistics*)

David P. Wilkins, Ph.D. (*Linguistics*)

Aram Yengoyan, Ph.D. (*Anthropology*)

Faculty

Wilbur A. Benware, Ph.D., Associate Professor
(*German*)

Diane Brentari, Ph.D., Assistant Professor

Nina F. Dronkers, Ph.D., Assistant Adjunct Professor

Linnea C. Ehri, Ph.D., Professor (*Education*)

Patrick Farrell, M.A., Acting Assistant Professor

James Gallant, Ph.D., Associate Professor (*Russian*)

Caroline Henton, D.Phil., Assistant Professor

María 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 (*Linguistics*)
 David L. Olmsted, Ph.D., Professor (*Anthropology*)
 Winfried Schleiener, Ph.D., Professor (*English*)
 Gwendolyn Schwabe, M.A., Senior Lecturer (*English*)
 Janet S. Smith, Ph.D., Associate Professor (*Anthropology*)
 Lenora A. Timm, Ph.D., Associate Professor
 Máximo Torreblanca, Ph.D., Professor (*Spanish*)
 Carolyn F. Wall, Ph.D., Lecturer (*Anthropology*)
 Benjamin E. Wallacker, Ph.D., Professor (*Chinese and Japanese*)
 Michael V. Wedin, Ph.D., Professor (*Philosophy*)
 David P. Wilkins, Ph.D., Assistant Professor
 Aram Yengoyan, Ph.D., Professor (*Anthropology*)

The Major Program

The discipline of linguistics encompasses a broad spectrum of knowledge about human language. Linguistics focuses on theories of language, description of contemporary languages, and the study of language change through time. It also has important applications within many other disciplines such as anthropology, biology, communications, education, language teaching, literature, philosophy, psychology, and sociology.

The Program. An introductory lower division course provides students with basic concepts and some of the methods needed to analyze language in a systematic way. Upper division courses probe more deeply into specific aspects of language structure, language use, and the relationship of language to other realms of human activity.

Career Alternatives. Majors in linguistics find practical outlets for their linguistic training in various areas of employment; for example, in the computer science industry; in teaching English as a second language; in foreign language teaching; in elementary and secondary level bilingual-bicultural programs; in missionary work; in bilingual-bicultural curriculum development (for example, in publishing houses); in legal work; in speech therapy; or as lexicographers (for dictionaries). All these types of employment share an interest in persons skilled in the analysis of language, spoken and/or written—linguistics equips its students with just such skills.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-34
Linguistics 1	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 102, 109, 120, 139, 140, 164, 165	28
Linguistics 100, 170, or 172	4
At least 12 upper division units from the following courses:	12
Anthropology 111, 112, 113, 114, 117, 118, 119, 120, Education 117, 118, 151, English 105A, 105B, 107, French 160, 161, German 105, 106, 107, 108, Human Development 101, 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, 137	
<i>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.</i>	
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, 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. Brentari, Farrell, Timm, Benware
Lecture—3 hours; discussion—1 hour. Introduction to the study of language; its nature, diversity, and structure. General Education credit: Civilization and Culture/Introductory.
- 10. Elementary American Sign Language** (5) I. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 1 recommended. Introduction to American Sign Language grammar and vocabulary, with emphasis on conversational skills.
- 11. Elementary American Sign Language** (5) II. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 10. Continuation of course 10.
- 12. Elementary American Sign Language** (5) III. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 11. Continuation of course 11.
- 13. Intermediate American Sign Language** (5) I. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 12. Grammar review and vocabulary development; enhancement of conversational skills.
- 14. Intermediate American Sign Language** (5) II. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 13. Emphasis on classifier and numeral systems in American Sign Language; conversational practice.
- 15. Advanced American Sign Language** (5) III. The Staff
Recitation—4 hours; discussion—1 hour. Prerequisite: course 14. Study of American deaf culture through conversation and narratives; dialects of American Sign Language; deaf education.

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) III. Benware
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 109. Description and methods of the historical study of language; sound change, morphological change, syntactic change, semantic change.
- 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.
- 113. Language, Gender and Society** (4) II. Timm, Henton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Investigation of real and putative (stereotyped) sex-linked differences in language structure and usage, with a consideration of some social and psychological consequences of such differences.

Focus is on English, but other languages are also discussed. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Linguistics 1 or Anthropology 4.

115. Chicano Sociolinguistics (4) I. Timm
Lecture—3 hours; term paper. Prerequisite: course 1 and Spanish 3, or the equivalent. Topics covered include the linguistic features of Chicano Spanish, Spanish-English code-switching, regional and social diversity in Chicano Spanish, Chicano English, the acquisition of bilingualism, language choice and use, attitudes about Spanish and English, Spanish language maintenance and shift, Chicano bilingualism and education. Offered in alternate years.

116. The Spanish Language in the United States (4) III. Torreblanca
Lecture—3 hours; term paper. Prerequisite: Spanish 28 or the equivalent, and course 1 or Spanish 132. Linguistic features of the varieties of the Spanish language spoken throughout the United States: phonology, morphology, syntax, vocabulary. The main focus is the relationship between United States Spanish and other world varieties of Spanish, within a historical framework.

120. Semantics (4) I. Ojeda
Lecture—3 hours; 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.

135. Introduction to Psycholinguistics (4) I.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; courses 139, 140 recommended. Introduction to psychological issues relating to language and to the implications of research in psychology for linguistic theory.

***138. Language Development** (4) III. ———
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, Brentari
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) I. Farrell
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Introduction to syntactic analysis; survey of types of syntactic and semantic phenomena in natural languages. Emphasis will be on developing skills and data analysis, rather than on investigating formal aspects of the theoretical framework to be employed.

164. Introduction to Phonological Theory (4) III. Brentari
Lecture—3 hours; discussion—1 hour. Prerequisite: course 139. Introduction to contemporary phonological theory, with emphasis on autosegmental, metrical, and lexical theory.

165. Introduction to Syntactic Theory (4) II. Farrell
Lecture—3 hours; discussion—1 hour. Prerequisite: course 140. Introduction to syntactic theory, primarily through the detailed study of a major theory of syntax, emphasizing theoretical reasoning, argumentation and theory building

169. Current Theories of Syntax (4) III. Ojeda, Farrell
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Examination of major contemporary theories of syntax.

170. Language Universals and Typology (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 165 (may be taken concurrently). Investigation into common features of all human languages and the classification of languages in terms of their structural features; theories of universal grammar; detailed discussion of a non-Indo-European language and comparison with English.

172. Language Structures (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: courses 102, 139, 140. In-depth study of the structure of a particular language or members of a language family or area. May be repeated for credit.

175. Biological Basis of Language (4) III. Dronkers
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Overview of issues in the field of neurolinguistics and techniques used to explore representation of language in the human brain.

192. Internship in Linguistics (1-12) I, II, III. The Staff (Timm in charge)
Internship—3-36 hours; two written reports. Prerequisite: course 1 or the equivalent. Internship applying linguistic-related skills to a fieldwork project in areas such as media, law, or industry, in approved organizations or institutions. Maximum of 4 units applicable toward major. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Director in charge)
Individual study—1-5 hours. Prerequisite: open only to Linguistics majors of senior standing who qualify for honors program. Guided research, under the direction of a faculty member approved by the Program Director, leading to a senior honors thesis. (P/NP grading only.)

197T. Tutoring in Linguistics (1-4) I, II, III. The Staff (Chairperson in charge)
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 (P/NP grading only.)

Graduate Courses

202. Principles of Historical Linguistics (4) III. Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: course 102. Advanced treatment of the theory and methods of historical linguistics. Offered in alternate years.

209. Advanced Phonetics (4) II. 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 alternate years.

210. Advanced Semantic Theory and Analysis (4) II. Ojeda
Lecture—3 hours; term paper. Prerequisite: course 120, 140. Advanced critical exploration of contemporary theories of linguistic semantics. Offered in alternate years.

***220. Romance Linguistics (4) II.** Manea-Manoliu
Seminar—3 hours; term paper. Prerequisite: one course from the following: courses 102, 139, 140. The development of the major Romance languages from Proto-Romance to the modern era. Selected topics in the structure of modern Romance languages. Option of focus on phonology, syntax, or historical linguistics.

225A. Modern Linguistic Theory: Structuralism (4) II. Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: courses 139, 140. Survey of the development of structural linguistics from deSaussure to the 1950s. Offered in alternate years.

225B. Modern Linguistic Theory: Generative Grammar (4) III. Ojeda
Lecture—3 hours; term paper. Prerequisite: courses 139, 165. Survey of the development of generative grammar and its offshoots from the 1950s to the present. Offered in alternate years.

239. Advanced Phonological Theory and Analysis (4) III. Henton, Brentari
Lecture—3 hours; term paper. Prerequisite: course

139. Critical overview of current phonological theories. Offered in alternate years.

250A-250B-250C-250D. Topics in Linguistic Theory and Methods (4-4-4-4) I, II, III. The Staff
Seminar—3 hours; paper. Prerequisite: graduate standing and consent of instructor. Introduction to current research in various aspects of linguistics.

265. Advanced Syntactic Theory and Analysis (4) III. Farrell
Lecture—3 hours; term paper. Prerequisite: course 165. Critical survey of contemporary theories of syntax, with concentration on functionalist theories. Offered in alternate years.

280. Theory of English as a Second Language (4) I. The Staff
Lecture—3 hours; term paper. Theoretical issues that have influenced the teaching of English as a second language. Contributions of collateral disciplines—psycholinguistics, sociolinguistics, and cognitive psychology—to English as a second language instruction.

281. Research on Second Language Acquisition (4) II. Merino
Lecture—2 hours; laboratory—1 hour; term paper; computer projects. Prerequisite: upper division or graduate standing. Analysis of theory/research on L2 acquisition. Topics include: contrast of L1/L2 acquisition; current theories of L2 such as the natural order and input hypotheses, as well as effects of individual variation, cognition, motivation on L2; research design and basic statistical analyses.

282. Individual and Social Aspects of Bilingualism (4) III. Timm
Lecture—3 hours; term paper. Broad overview of bi- and multilingualism, with focus on theoretical and descriptive research; topics covered range from language processing in bilinguals to code-switching to language as political issue in multilingual states.

297T. English as a Second Language Teaching/Tutoring (4) III. Schwabe
Clinic—4 hours. Prerequisite: course 300, English 302 and 303 (may be taken concurrently). Teaching classes for ESL graduate students in the UC Davis ESL Clinic in pronunciation, listening, reading, writing, etc.; aiding the ESL undergraduate composition classes; tutoring foreign graduate student TAs in pronunciation; observing and critiquing off-campus ESL classes. Does not fulfill requirement toward the M.A. May be repeated for credit. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (S/U grading only.)

Professional Course

300. The Teaching of English as a Foreign Language (4) I. _____
Lecture—3 hours; laboratory—3 hours. Prerequisite: English 105A or course 109 or consent of instructor. Methods of teaching English to nonnative speakers, stressing particularly recent linguistic methodology and techniques.

Linguistics (A Graduate Group)

_____, Ph.D., Chairperson of the Group (916-752-2999)

Group Office, 922 Sproul Hall (916-752-9933/1219)

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) neurolinguistics, and (e) linguistic description (contemporary or historical) of a particular language or group of languages.

In general, the M.A. in Linguistics at UCD is intended to serve as preparation for advanced graduate work at the Ph.D. level, as a supplement to studies in related fields—especially anthropology, psychology, philosophy, the various languages, or as a major component in the training for a professional career (such as TESOL, speech therapy, and foreign language teaching). The program is structured so as to place considerable emphasis on interdisciplinary studies, thereby increasing the breadth of the candidate's knowledge, and providing a wider and more flexible variety of options to pursue thereafter.

Preparation. Applicants to the M.A. program who do not have a bachelor's degree in Linguistics must complete the following courses in Linguistics from the undergraduate program: 109 (phonetics), 102 (historical linguistics), 120 (semantics), 139 (phonological analysis), 140 (grammatical analysis), and 165 (introduction to syntactic theory).

Requirements. The requirements for the two tracks differ. The track in applied linguistics and TESOL operates under Plan I or Plan II program. Thirty-six units of upper division and graduate course work above and beyond the prerequisite courses listed under Preparation (above) are required for Plan II, and at the end of the course work 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 course work 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 (*Linguistics*).

Literature in Translation

The following courses are open to students throughout the campus. The readings can be in English. Refer to departmental listing for the course description.

Chinese

- 10. Modern Chinese Literature
- *11. Great Books of China
- 104. Twentieth-Century Chinese Fiction (in English)
- *105. Western Influences on Twentieth-Century Chinese Literature (in English)
- *106. Chinese Poetry (in English)
- 107. Traditional Chinese Fiction (in English)
- *108. Poetry of China and Japan
- *109A-I. Topics in Chinese Literature (in English)

Classics

- 140. Homer and Ancient Epic
- 141. Greek and Roman Comedy
- *142. Greek and Roman Novel
- 143. Greek Tragedy

Comparative Literature

- 1. Great Books of Western Civilization: From Myth to Faith
- 2. Great Books of Western Civilization: From Faith to Reason
- 3. Great Books of Western Civilization: The Modern Crisis
- 4. 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
- 12. Introduction to Women Writers
- *13. Dramatic Literature

- *15. The Spiritual Quest
- 20. Man and the Natural World
- 25. Ethnic Minority Writers in World Literature
- *53A. Literature of China and Japan
- 53B. Literature of India and Southeast Asia
- 135. Women Writers
- 140. Thematic and structural Study of Literature
- 141. Literary Theory and Criticism
- 145. Representations of the City
- *146. Myth in Literature
- *153. The Forms of Asian Literature
- 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. Romanticism
- *168B. Realism and Naturalism
- *169. The Avant-Garde
- *170. The Contemporary Novel

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 *Wethers*
- 117A. The *Tristan* Tradition: Medieval, Musical, Modern
- *117B. The *Nibelungen* Tradition: Medieval, Musical, and Modern
- *118A. Fin-de-siècle Vienna (The Swan Song of the Habsburg Empire)
- *118B. Weimar Culture: Defeat, the Roaring Twenties, the Rise of Nazism
- 119. From German fiction to German Film
- *140. German Political Literature from the Middle Ages to the Present
- 141. The Holocaust and its Literary Representation
- 142C. New German Cinema: From Oberhausen to the Present

Italian

- 25. Italian Literature in Translation
- *139A. Early Italian Literature and Dante Alighieri
- 139B. Boccaccio, Petrarch and the Renaissance
- *139C. Modern Italian Literature

Japanese

- *10. Masterworks of Japanese Literature (in English)
- *15. Introduction to Traditional Japanese Culture
- 101. Japanese Literature in Translation: The Early Period
- 102. Japanese Literature in Translation: The Middle Period
- 103. Japanese Literature in Translation: The Modern Period
- *104. Modern Japanese Literature: War and Revolution
- *105. Modern Japanese Literature: Hero and Anti-Hero
- *106. Japanese Culture through Films
- *108. Poetry of China and Japan

Native American Studies

- 181A. Native American Literature (the novel and fiction)
- 181B. Native American Literature (non-fiction works by native authors)
- 181C. Native American Literature (traditional literature and poetry)
- 188. Special Topics in Native American Literary Studies

Russian

- 41. Survey of Nineteenth-Century Russian Literature
- 42. Survey of Twentieth-Century Russian Literature
- 44. Children's Literature in Russia
- *121. Nineteenth-Century Russian Prose
- 123. Twentieth-Century Russian Prose
- *126. The Russian Theater
- 130. Contemporary Soviet Culture
- *131. Literature of Revolution
- *132. Nature and Culture in the Soviet Union
- *140. Dostoevsky
- 141. Tolstoy
- *150. Russian Culture
- 151. Soviet Writers and Censorship
- 154. Russian Folklore
- 166. Representations of Sexuality in Russian Literature

Scandinavian

- 110. Masterworks of Scandinavian Literature in Translation
- 111. Swedish Film as Narrative

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

Robert H. Smiley, Ph.D., Dean
School Office, 308 Voorhies Hall (916-752-7362)

Faculty

Brad Barber, Ph.D., Assistant Professor
Nicole W. Biggart, Ph.D., Associate Professor (*Management, Sociology*)
George Bittingmayer, Ph.D., Associate Professor
David S. Bunch, Ph.D., Assistant Professor
Richard P. Castanias, Ph.D., Associate Professor
Peter Clark, Ph.D., Professor

Scott Davis, Ph.D., Assistant Professor
Richard C. Dorf, Ph.D., Professor (*Management, Electrical and Computer Engineering*)
Paul A. Griffin, Ph.D., Professor
Michael Hagerty, Ph.D., Associate Professor
Michael Maher, Ph.D., Professor
Alexander F. McCalla, Ph.D., Professor (*Agricultural Economics*)
Arthur M. O'Sullivan, Ph.D., Associate Professor (*Management, Economics*)
Donald Palmer, Ph.D., Associate Professor
David M. Rocke, Ph.D., Professor
Jerome J. Suran, B.S., Ph.D. (hon.), Senior Lecturer (*Management, Electrical and Computer Engineering*)
Donald M. Topkis, Ph.D., Professor
Chih-Ling Tasi, Ph.D., Associate Professor
Gary M. Walton, Ph.D., Professor (*Management, Economics*)
David Woodruff, Ph.D., Assistant Professor

Courses in Management

Lower Division Course

100. Introduction to Financial Accounting (3)

Griffin

Lecture—3 hours. Prerequisite: no prior knowledge of accounting is required. Course is open to all upper division undergraduate and graduate students, except those in the Graduate School of Management. Introduction to the concepts, methods, and uses of accounting and financial reporting. Preparation of financial statements, including balance sheet and statements of income and cash flow, as well as their analysis by investors and managers.

Graduate Courses

(Core Courses)

201A. Financial Accounting and Reporting (3)

Griffin

Lecture—3 hours. Introduction to the basic principles of accounting, financial reporting and policy, with special attention to the preparation, analysis, and evaluation of published corporate financial statements. Topics include income measurement and valuation, assets and liabilities, owner's equity and intercorporate investments.

201B. Management Accounting and Control (3)

Maher

Lecture—3 hours. Prerequisite: course 201A. Provides an introduction to the preparation, analysis, and evaluation of data provided by cost accounting for management planning and control, budgeting, performance evaluation, and investment decision making.

202. Organizational Behavior (3) 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 of alternative theoretical models.

203. Organization Theory (3) 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) O'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) Bittingmayer

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) The Staff

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) 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) Hagerty

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) Topkis/Woodruff

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) The Staff

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) The Staff

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) Bunch

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; courses 210A-210B. 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) 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) O'Sullivan

Lecture—3 hours. Fiscal role of government in a mixed economy and democratic society; economics and politics of taxation and resource allocation; inter-governmental financial relations; budgeting activities of local governments.

224. Human Resources Management (3) Biggart

Lecture—3 hours. Problems of recruiting, training, motivating, compensating, and separating workers in contemporary organizations. Topics include design of incentive systems, career management, professionalization, alienation, worker burnout, organizational deviance, and current issues such as affirmative action and the unionization of public employees.

225. Labor Relations (3) The Staff

Lecture—3 hours. Course deals with labor organization, employment relationships, employer-employee negotiations, contracts, and litigation. Worker and management rights, and collective bargaining in the public and private sectors will be explored.

228. Statistical Quality Control and Productivity Improvement (3) Roche

Lecture—3 hours. Prerequisite: courses 210A and 210B or the equivalent. Introduces concepts of quality and productivity improvement as applied to service and production industries and the public sector. Methods covered include statistical quality control techniques such as control charts and acceptance sampling, reliability, and graphical tools.

232. Urban Policy and Planning (3) The Staff

Lecture—3 hours. Analysis of public policy in an urban setting, focusing on the efficiency effects of such policies. Topics include urban spatial structure, growth-management policies, housing, transportation, environmental quality, local government finance, and urban planning.

233. Regulation and Policy in Agriculture (3) The Staff

Lecture—3 hours. Implications for management of regulation and public policy on agricultural production choices, practices, processing, and marketing; influences on management strategy, organization, business practices, and resource productivity; trends in regulation and policy and their potential for management strategies are explored.

240. Management Policy (3) 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) Bunch

Lecture—3 hours. Develops analytical skills for evaluating decisions and solving problems in various managerial settings. Emphasis is on problem structuring, decision analysis, and implementation. Course examines individual decision strategies, group processes, and organizational decision making.

244. New and Small Business Ventures (3) Dorf

Lecture—3 hours. Emphasizes starting a new business venture or managing a small, ongoing business during its formative stages. The business plan. Legal forms, financial considerations, the management team. The entrepreneur. Students develop a detailed business plan.

248. Marketing Strategies (3) Hagerty

Lecture—3 hours. Examines process by which organizations develop strategic marketing plans. Includes definition of activities and products, marketing audits, appraising market opportunities, design of new activities and products, and organizing marketing planning function. Applications to problems in private and public sector marketing.

249. Marketing Research (3) Hagerty

Lecture—3 hours. Course addresses the managerial issues and problems of systematically gathering and analyzing information for making private and public marketing decisions. Covers the cost and value of information, research design, information collection, measuring instruments, data analysis, and marketing research applications.

250. Technology Management (3) 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. Management of Innovation (3) Suran

Lecture—3 hours. Managing innovative enterprise in changing and uncertain environments. Covers technology forecasting and assessment, program selection and control, financial management, regulation, and ethics.

252. Production and Operations Management (3) Woodruff

Lecture—3 hours. Explores methods of increasing

operational efficiency in production and service organizations through planning and scheduling, materials management, inventory control, quality control, and distribution. Methodologies employed include such techniques as programming, simulation, systems analysis, queueing, and network models.

260. Financial Management (3) Blittingmayer

Lecture—3 hours. Focuses on planning, acquiring, and managing a company's financial resources. Includes discussion of financial aspects of mergers and other forms of reorganization; analysis of investment, financial, and dividend policy; and theories of optimal capital structure.

261. Investment Analysis (3) Barber

Lecture—3 hours. Examines modern asset pricing theory and the implications of that theory for the analysis and management of stocks, bonds, and other financial securities. Factors influencing the value of stocks, bonds, options, warrants, and other securities are discussed from the perspective of a portfolio fund manager.

262. Money and Security Markets (3) Blittingmayer

Lecture—3 hours. Examines how money and securities markets are organized; how public agencies, businesses, others obtain and invest funds in those markets. Relationship between interest rates, monetary policy, government's role in improving capital markets, approaches to assessing changes in regulation in specific markets.

263. Options and Futures Markets (3) Clark

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) 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) Castanias

Lecture—3 hours. Prerequisite: course 207 or the equivalent. Theory of financial decision making.

266. International Finance (3) Castanias

Lecture—3 hours. Prerequisite: course 207 or the equivalent. Open economy macroeconomics, balance of payments theory, and financial decision making in multinational firms.

270. Corporate Financial Reporting (3) Griffin

Lecture—3 hours. Analyzes and evaluates contemporary issues in financial reporting and develops implications of those issues for business decision makers, investment managers, and accounting policy makers.

271. Accounting and Budgeting for Management Control (3) Maher

Lecture—3 hours. Examines concepts and techniques of accounting and budgeting for management decision making in the private sector. Topics include cost control, capital budgeting, performance evaluation, and the effects of uncertainty in achieving management objectives.

272. Evaluation of Financial Information (3) Griffin

Lecture—3 hours. Studies how investors, creditors, others use accounting and other information in making rational investment, lending decisions. Emphasis is placed on the analysis of financial information in a variety of contexts. Where applicable, recent research in finance and economics is discussed.

273. Accounting and Reporting for Governmental and Nonprofit Entities (3) The Staff

Lecture—3 hours. Concepts, methods, and uses of accounting and financial reporting by governmental and nonprofit entities. Introduction to budgeting and performance evaluation, and accounting for entities such as hospitals, universities, and welfare agencies.

274. Auditing, Internal Control, and Public Accounting (3) The Staff

Lecture—3 hours. Concentrates on role of the inde-

pendent 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) Topkis

Lecture—3 hours. Concepts of information storage and retrieval on digital computers. Emphasis on file structures and their uses within organizations; applications drawn from both the public and private sector.

281. Systems Analysis and Design (3) Woodruff

Lecture—3 hours. Design and specification of computer-based information systems. Applications systems development life cycle, use requirements and feasibility assessment, logical and physical design, program development and testing, conversion and implementation.

***283. Optimization Theory and Applications (3) Topkis**

Lecture—3 hours. Introduces applied optimization theory. Examines linear, nonlinear, discrete, and dynamic programming; optimality conditions; transportation, networks, and large-scale systems; and computer implementation. Applications are made to problems in private and public management.

284. Applied Linear Models for Management (3) Tsai
Lecture—3 hours. Covers regression, analysis of variance, and multivariate analysis. Topics will focus on applications to management and policy problems.

285. Time Series Analysis and Forecasting (3) Tsai
Lecture—3 hours. Considers application of time series methods to evaluation and forecasting problems. Covers univariate and multivariate ARIMA models and transfer function models. Applications will be in such areas as economics, finance, budgeting, program evaluation, and industrial process control.

286. Telecommunications and Computer Networks (3) Topkis

Lecture—3 hours. Prerequisite: course 280. Communication system components; common carrier services; design and control of communications networks; network management and distributed environment; local area networks; data security in computer networks.

287. Database Systems (3) Topkis

Lecture—3 hours. Prerequisite: course 280. Hierarchical, network, and relational models for database systems. Design and implementation of models. Performance evaluation and benchmarking. Query structures and languages. Data security and integrity. Application to managerial decision making and decision support systems.

288. Special Topics in Management of Information Systems (3) Topkis

Lecture—3 hours. Managerial aspects of information systems. Topics stressing applications in organizations chosen from: economics of computers and information systems, decision support systems, management of computer-based information systems, office automation.

290. Seminar in Management (3)

Seminar—3 hours. Interdisciplinary case study of a real business or government enterprise.

298. Directed Group Study (1-5) The Staff

Prerequisite: consent of instructor.

299. Individual Study (1-12) The Staff

Prerequisite: consent of instructor. (S/U grading only.)

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, Division of Education, Environmental Design, Environmental Horticulture, Nutrition, Plant Science, Psychology, and Textiles and Clothing.

Graduate Study. The Master of Education Graduate Group is housed in the Department of Applied Behavioral Sciences. Master of Education (M.Ed.) degree students are preparing for leadership and professional roles in community and development education related to planning, organizational change, and evaluation. Areas of study include: health education planning; community services planning and program management; community and non-formal education; international development education; program design and evaluation; organizational decision making; leadership development, communication and change; extension education; environmental education; agricultural development education; and consumer behavior.

Requirements. The M.Ed. degree requires 36 units minimum of upper division and graduate courses. A minimum of 18 of these units must be graduate level courses; and at least 8 units must be related to research methods and/or statistics. Students submit a required Program of Study Plan in the area of intended specialization by the end of the first quarter of graduate study. A field project and comprehensive oral examination are required for completion of this degree.

Graduate Adviser. Contact Group office.

Mathematics

(College of Letters and Science)

Arthur J. Krener, Ph.D., Chairperson of the Department

R. J. B. Wets, Ph.D., Vice-Chairperson of the Department (Graduate Matters)

Sherman K. Stein, Ph.D., Vice-Chairperson of the Department (Undergraduate Matters)

Department Office, 565 Kerr Hall (916-752-0827)

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
David J. Barsky, Ph.D., Assistant 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., Associate Professor
Albert Chvarts, Ph.D., Professor
Doyle O. Cutler, Ph.D., Professor
James R. Diederich, Ph.D., Professor
Allan L. Edelson, Ph.D., Professor
Alice Fialowski, Ph.D., Associate Professor
Curtis M. Fulton, Ph.D., Professor Emeritus
Robert D. Glauz, Ph.D., Professor
Joel Hass, Ph.D., Associate Professor
Charles A. Hayes, Jr., Ph.D., Professor Emeritus
Frederick A. Howes, Ph.D., Professor
John K. Hunter, 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
David G. Mead, Ph.D., Professor
E. O. Milton, Ph.D., Professor
Motohico Mulase, Ph.D., Visiting Associate Professor
Donald A. Norton, Ph.D., Professor Emeritus
Washek F. Pfeffer, Ph.D., Professor

E. Gerry Puckett, Ph.D., Assistant 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., Professor Emeritus
Takayuki Tamura, D.Sc., Professor Emeritus
J. Blake Temple, Ph.D., 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

Mathematics is the study of abstract structures, space, change, and the interrelations of these concepts. It also is the language of the exact sciences.

The Program. Students majoring in mathematics may follow a program leading to either the Bachelor of Arts or the Bachelor of Science degree. After completing basic introductory courses such as calculus, students plan an upper-division program in consultation with a faculty adviser. This individualized program can lead to graduate study in pure or applied mathematics, to elementary or secondary level teaching, or to other professional goals. It can also reflect a special interest such as computer science, statistics, or applied mathematics, or may be combined with a major in some other field.

Career Alternatives. A degree in mathematics provides entry to many careers in addition to teaching. For instance, operations research, systems analysis, computing, actuarial work, insurance, and financial services are only a few such careers. Mathematics is also a sound basis for graduate work in a variety of fields, such as law, engineering, and economics.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter	36-39
Mathematics 11 (or high school equivalent) ...	0-3
Mathematics 21A, 21B, 21C, 22A, 22B ...	18
Mathematics 22C or 36	3
Computer Science Engineering 30 or Engineering 5	3-4
Physics 8A	4
Additional non-Mathematics courses chosen from natural sciences	8
Core Requirements	36
Mathematics 108	4
Mathematics 127A, 127B	8
Mathematics 150A, 150B	8
Choose one Track from the following two	16
Track 1: Secondary Teaching	
Mathematics 115A	3
Mathematics 141	3
Additional upper division units	10
Recommended: Mathematics 115B, 115C, 116, 167, 168; Mathematics 131 and Statistics 131B or Statistics 131A-131B or Statistics 130A-130B; Computer Science Engineering 110, 122	
Track 2: General Mathematics	
Additional upper division units	16
Total Units for the Major	72-75

B.S. Major Requirements:

UNITS

Preparatory Subject Matter	28-39
Mathematics 11 (or high school equivalent) ...	0-3
Mathematics 21A, 21B, 21C, 22A, 22B ...	18
Computer Science Engineering 30 or Engineering 5	3-4
Mathematics 22C (Tracks 1 and 2 only) ...	3
Mathematics 22C or 36 (Tracks 3 and 4 only)	3
Physics 9A, 9B, 9C (Tracks 1 and 2 only) ..	12
Physics 9A (Track 3 only)	4
Statistics 13 or 102 (Track 4 only)	4

Master of Education (M.Ed.) (A Graduate Group)

James Grieshop, Ph.D., Chairperson of the Group
Group Office, 103 AOB 4 (916-752-1926).

Core Requirements45
 Mathematics 1084
 Mathematics 127A, 127B8
 Mathematics 150A, 150B8
 Choose one Track from the following four25

Track 1: Preparation for Graduate Study in Mathematics

Mathematics 127C4
 Mathematics 150C4
 One course from Mathematics 125, 126, 1473
 Additional upper division units14
 Recommended: Mathematics 118A, 118B, 119, 125, 126, 141, 147, 185A, 185B

Track 2: Applied Mathematics

Mathematics 1673
 Two courses from Mathematics 128A, 128B, 128C8
 Additional upper division units14
 Recommended: Mathematics 118A, 118B, 118C, 119, 145, 168, 185A, 185B, Statistics 131 or Mathematics 131A, Computer Science Engineering 110, 122, up to 8 units of courses outside of mathematics department related to area of interest

Track 3: Mathematics for Secondary Teaching

Mathematics 115A3
 Mathematics 1413
 Additional upper division units19
 Recommended: Mathematics 115B, 115C, 167, 168, Statistics 130A, 130B, or 131 and Statistics 131B or Statistics 131A, 131B, Computer Science Engineering 110, 122

Track 4: General Mathematics

Additional upper division units25

Total Units for the Major73-84

Recommended Language Preparation

Bachelor of Science degree candidates are advised, but not required, to satisfy the same language requirement as that for a Bachelor of Arts degree candidate, and to fulfill it in French, German, or Russian.

Depth Subject Matter Requirements

Certain mathematically oriented courses given by other departments may be admissible in partial satisfaction of the above mentioned 36- or 45-unit requirements with prior departmental approval. In general, 192, 197TC, 198, and 199 courses are not appropriate for application towards this requirement; and any exceptions must be approved by the Department's Undergraduate Program 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.O. Milton, E. M. Silvia, J.B. Temple.

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 mathemat-

ics, 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
Mathematics20
 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, W.F. Pfeffer, G.T. Sallee (M.A.T. degree).

Courses in Mathematics

Lower Division Courses

B. Elementary Algebra (no credit) I. The Staff
 Lecture—3 hours. Basic concepts of algebra, including polynomials, factoring, equations, graphs, and inequalities. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$45.)

C. Trigonometry (no credit) I, II. The Staff
 Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$30.)

D. Intermediate Algebra (no credit) I, II. The Staff
 Lecture—3 hours. Basic concepts of algebra, designed to prepare the student for college work in mathematics, such as course 16A or 21A. Functions, equations, graphs, logarithms, and systems of equations. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$15.)

***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 Precalculus Qualifying Examination. Analytic geometry in two dimensions; elementary functions. (Not open to students who have completed courses 16A-16B-16C or 21A-21B-21C.)

12. Precalculus (3) I, II, III. The Staff
 Lecture—3 hours. Prerequisite: two years high school algebra, plane geometry, plane trigonometry; and obtaining required score on Precalculus Qualifying Examination. Topics selected for their use in calculus, including functions and their graphs, slope, zeroes of polynomials, exponential, logarithmic and trigonometric functions, sketching surfaces and solids. (Not open to students who have completed 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 Precalculus Qualifying Examination. Limits; differentiation of algebraic functions; analytic geometry; applications, in particular to maxima and minima prob-

lems. 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 Precalculus Qualifying Examination. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, extrema of a function. Differentials. L'Hopital's rule. Only two units of credit will be allowed to students who have credit for course 16A. (Not open to students who have completed course 16B.) (CAN Math 18)

21AH. Honors Calculus (4) I. The Staff
 Lecture/discussion—4 hours. Prerequisite: a Precalculus Qualifying Examination score significantly higher than the minimum for course 21A is required. More intensive treatment of material covered in course 21A.

21B. Calculus (4) I, II, III. The Staff
 Lecture/discussion—4 hours. Prerequisite: course 21A or 21AH. Continuation of course 21A. Definition of definite integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integrals, surface of revolution. Only two units of credit will be allowed students who have received credit for course 16B or 16C.

21BH. Honors Calculus (4) II. The Staff
 Lecture/discussion—4 hours. Prerequisite: a grade of B or better in course 21A or 21AH. More intensive treatment of material covered in course 21B. Students completing 21BH can continue with course 21CH or the regular 21C.

21C. Calculus (4) I, II, III. The Staff
 Lecture/discussion—4 hours. Prerequisite: course 21B or 21BH. Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables. Definite integrals over plane and solid regions in various coordinate systems. Applications to physical systems.

21CH. Honors Calculus (4) III. The Staff
 Lecture/discussion—4 hours. Prerequisite: a grade of B or better in course 21B or 21BH. More intensive treatment of material covered in course 21C.

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 9 sequence, 9B-9C-9D, courses should be taken in reverse order, 22C, 22B, 22A.) (CAN Math 26)

22B. Differential Equations (3) I, II, III. The Staff
 Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations. (CAN Math 24)

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.

36. Fundamentals of Mathematics (3) I. 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

*Course not offered this academic year.

rational and irrational, binary and other number systems. Not open to those who have received credit for course 108. Recommended for non-math majors.

63. Survey of Advanced Mathematics (3) II. The Staff

Lecture—3 hours. Prerequisite: obtaining required score on Precalculus Qualifying Examination. Survey of various areas of mathematics for the prospective mathematics major. Topics selected from algebra, analysis, geometry, topology, combinatorics, logic, and applications, with emphasis on techniques of proof, problem solving, and exposition. Not open to students who have taken course 108.

71A-71B. Explorations in Elementary Mathematics (3-3) I-II. The Staff (Chairperson in charge)

Lecture—2 hours; laboratory—3 hours. Prerequisite: two years of high school mathematics. Weekly explorations of mathematical ideas related to the elementary school curriculum will be carried out by cooperative learning groups. Lectures will provide background and synthesize the results of group exploration. (Deferred grading only, pending completion of sequence.)

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 alternate years.

115A. The Theory of Numbers (3) I. Alder
Lecture—3 hours. Prerequisite: course 108. Divisibility and related topics, diophantine equations, selected topics from the theory of prime numbers.

115B. The Theory of Numbers (3) II. Alder
Lecture—3 hours. Prerequisite: course 108. Euler function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in alternate years.

115C. The Theory of Numbers (3) III. Alder
Lecture—3 hours. Prerequisite: course 108. Continued fractions, partitions. Offered in alternate years.

***116. Metric Differential Geometry (3) III.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22C; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in alternate years.

118A. Partial Differential Equations: Elementary Methods (3) I. The Staff

Lecture—3 hours. Prerequisite: courses 22A, 22B, 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 alternate 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 alternate years.

127A-127B-127C. Advanced Calculus (4-4-4) I, II-III, III-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. Course 132B is offered in even-numbered years.

141. Euclidean Geometry (3) II. The Staff

Lecture—3 hours. Prerequisite: course 108. An axiomatic and analytic examination of Euclidean geometry from an advanced point of view. In particular, a discussion of its relation to other geometries.

145. Combinatorial Mathematics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 108. Combinatorial methods using basic graph theory counting methods, generating functions, and recurrence relations.

147. Topology (3) III. The Staff (Chairperson in charge)

Lecture—3 hours. Prerequisite: course 108, 127A. Basic notions of point-set and combinatorial topology. Offered in alternate years.

150A-150B-150C. Introduction to Abstract Algebra (4-4-4) I, II-II, III-III. The Staff

Lecture/discussion—4 hours. Prerequisite: course 108. Basic concepts of groups, rings, and fields. Emphasizes the techniques used in the proofs of the ideas (Lemmas, Theorems, etc.) developing these concepts. Develops precise thinking, precise writing, and the ability to deal with abstraction.

***160. Mathematical Foundations of Database Theory, Design, and Performance (3) I.** Diederich

Lecture—3 hours. Prerequisite: course 108 and familiarity with one high-level computer language. The relational model; relational algebra; relational calculus; normal forms; functional and multivalued dependencies. Separability. Cost benefit analysis of physical database design and reorganization. Performance via analytical modeling, simulation, and queueing theory. Block accesses: buffering; operating system contention; CPU intensive operations.

***164. Mathematical Foundations of Fifth Generation Computing (3) II.** Milton

Lecture—3 hours. Prerequisite: course 108 and a modern high-level computer language. Study of the uses of predicate and various logics in knowledge-based systems. Resolution and non-resolution deduction, forward and backward deduction systems, logic programming, symbolic integration, problem solving strategies, functions in search strategies, mathematical treatment of uncertainty in expert systems.

167. Linear Algebra and Applications (3) 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 alternate years.

192. Internship in Applied Mathematics (1-3) I, II, III. The Staff (Chairperson in charge)

Internship; final report. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised work experience in applied mathematics. May be repeated for credit for a total of 10 units. (P/NP grading only.)

194. Undergraduate Thesis (3) I, II, III. The Staff
Prerequisite: consent of instructor. Independent research under supervision of a faculty member. Student will submit written report in thesis form. May be repeated with consent of Vice Chairperson. (P/NP grading only.)

197TC. Tutoring Mathematics in the Community (1-5) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours; laboratory—2-6 hours. Prerequisite: upper division standing and consent of instructor. Special projects in mathematical education which involve the development of techniques for mathematics instruction and tutoring on an individual or small group basis. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201A-201B-201C. 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. Functional Analysis** (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 201D. Introduction to topological vector spaces. Metrization, Banach-Steinhaus theorem, the open mapping theorem, the closed graph theorem, the Hahn-Banach theorem. Duality and convexity. Weak topologies. Applications. Offered in alternate years.

***202B. Functional Analysis** (4) III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 202A. One of the following topics will be covered: (a) distributions and Fourier transforms and their applications to partial differential equations; (b) theory of bounded and unbounded linear operators and their spectral decomposition; (c) non-linear functional analysis. Offered in alternate 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 alternate years.

***215A-215B-215C. Topology** (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (Instructor's option). Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology, homotopy theory, and homology theory. Offered in alternate years.

***218A-218B. Partial Differential Equations** (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in alternate years.

219A-219B. Ordinary Differential Equations (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the real and complex domains; existence and uniqueness theorems; linear systems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in alternate years.

221A-221B. Mathematical Fluid Dynamics (3-3) I-II. The Staff

Lecture—3 hours. Prerequisite: course 118B. Dynamics of fluid motion, perfect fluids, rotational and irrotational motion, two-dimensional and three-dimensional axisymmetric flows, compressible and incompressible viscous fluids. Offered in alternate years.

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 alternate years.

***228A-228B-228C. Numerical Solution of Differential Equations** (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 128C. Numerical solutions of initial-value, eigenvalue and boundary-value problems for ordinary differential equations. Numerical solution of parabolic and hyperbolic partial differential equations. Offered in alternate years.

229A-229B. Numerical Methods in Linear Algebra (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: consent of instructor.

Computational methods for the solution of linear algebraic equations and matrix eigenvalue problems. Analysis of direct and iterative methods. Special methods for sparse matrices. Offered in alternate years.

235A-235B-235C. Probability Theory (3-3-3) I-II-III. The Staff

Lecture—3 hours. Prerequisite: course 127C and Statistics 131A-131B or the equivalent. Measure theoretic foundations, abstract integrations, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. (Same course as Statistics 235A-235B-235C.)

240A-240B-240C. Differential Geometry (3-3-3) I-II-III. The Staff (Chairperson in charge)

Lecture—3 hours. Prerequisite: course 116 or consent of instructor. Introduction to differentiable manifolds, the tangent bundle, tensor fields, differential forms. DeRham cohomology, connections, Lie groups, Riemannian geometry. Offered in alternate years.

250A-250B-250C. Algebra (4-4-4) I-II-III. The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour or paper (Instructor's option). Prerequisite: graduate standing in Mathematics or consent of instructor. Theory of groups, rings, and fields. Offered in alternate years.

257. Topics in Optimization (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Advanced topics in the theoretical foundations of optimization and its applications, such as: linear and nonlinear systems theory, stochastic programming, stochastic optimal control, approximation theory for optimization, advanced topics in numerical implementation of algorithms, shape optimization, large scale optimization, semi-infinite and nondifferentiable optimization with applications to engineering design, global optimizations. Offered in alternate years. (Same course as Electrical Engineering 257.)

***258A. Optimization I** (3) II. The Staff
Lecture—3 hours. Prerequisite: knowledge of FORTRAN or C. Modeling optimization problems existing in engineering design and other applications, optimality conditions, linear programming and unconstrained optimization (gradient, Newton, conjugate directions and minimax algorithms), convergence and rate of convergence, selected topics. Offered in alternate years. (Same course as Electrical Engineering 258A.)

258B. Optimization II (3) III. The Staff
Lecture—3 hours. Prerequisite: course 258A. Modeling constrained optimization problems existing in engineering design and other applications, optimality conditions, linearly and nonlinearly constrained optimization problems, projection, feasible directions and reduced gradient algorithms, interior point methods, Lagrangian theory, duality, augmented Lagrangians, sequential quadratic programming, selected topics. Offered in alternate years. (Same course as Electrical Engineering 258B.)

***259. Optimal Control, Theory and Algorithms** (3) I. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Optimal control and calculus of variations; existence of solutions to optimal control problem; necessary conditions of optimality, Pontryagin maximum principle, Euler equation; sufficient conditions of optimality, Hamilton-Jacobi-Bellman equation, linear quadratic regulator problem; algorithms for unconstrained and constrained optimal control problems. Offered in alternate years. (Same course as Electrical Engineering 259.)

***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 alternate 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 alternate 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 students with the major techniques developed for optimization problems. Offered in alternate 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. May be repeated for credit in different subject area.

290. Seminar (1-6) I, II, III. The Staff (Chairperson in charge)

Advanced study in various fields of mathematics, including the following: algebraic theory of semi-groups, control theory, mathematical logic, mathematical statistics, ordinary differential equations, partial differential equations, theory of distributions, and univalent functions. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300A. The Teaching of Mathematics, K-9 (3) I. The Staff

Lecture, discussion, laboratory, and field work—2-6 hours. Prerequisite: senior or graduate standing, simultaneous teaching experience, and sufficient background for the successful completion of the mathematics portion of the Commission for Teaching Preparation. Mathematics curriculum and teaching methods for grades K-9. Arrangements for enrollment in the course must be made at the beginning of the fall quarter through the Education Division.

390. Methods of Teaching Mathematics (3) I, II, III. The Staff

Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: graduate standing. Practical experience in methods and problems of the teaching of mathematics at the university level. Includes discussion of lecturing techniques, analysis of tests and supporting material, preparation and grading of examinations, and related topics. Required of departmental teaching assistants. May be repeated for credit. (S/U grading only.)

Medical Microbiology

See Medicine, School of

Medical Pharmacology and Toxicology

See Medicine, School of

Medicine

See Medicine (School of); and Medicine (Veterinary Medicine)

Medicine, School of

Hibbard E. Williams, M.D., Dean of the School
James J. Castles, M.D., Executive Associate Dean
John R. Elliot, Assistant Dean
Edward J. Hurley, M.D., Associate Dean
Ernest L. Lewis, M.D., Associate Dean
Frank J. Loge, M.B.A., Associate Dean
Donal A. Walsh, Ph.D., Associate Dean
Dean's Office, Medical Sciences 1C (916-752-0331)

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- Pasquale X. Montesano, M.D., Assistant Professor in Residence (*Orthopaedic Surgery*)
- Patrick Moore, M.B.B.S., Associate Professor of Clinical Anesthesiology (*Anesthesiology*)
- Michael Moran, M.D., Assistant Professor in Residence (*Urology*)
- Walter Morgan, M.D., Associate Professor of Clinical Family Practice (*Clinical Family Practice*)
- James Morrison, M.D., Associate Professor in Residence (*Psychiatry*)
- Thomas L. Morrison, Ph.D., Associate Professor in Residence (*Psychiatry*)
- Lawrence Morse, M.D., Assistant Professor in Residence (*Ophthalmology*)
- Rodney L. Moser, M.H.S., Lecturer (*Family Practice*)
- Christopher J. Murphy, D.V.M., Ph.D., Assistant Adjunct Professor (*Ophthalmology*)
- Jerome Murphy, M.D., Assistant Professor in Residence (*Pediatrics*)
- Tsutomu Nakada, M.D., Associate Professor in Residence (*Neurology*)
- Thomas Nesbitt, M.D., Assistant Professor of Clinical Family Practice (*Family Practice*)
- Kenneth R. Niswander, M.D., Professor Emeritus (*Obstetrics and Gynecology*)
- Thomas E. Nordahl, M.D., Ph.D., Assistant Professor (*Psychiatry*)
- Robert H. Noth, M.D., Associate Professor of Clinical Internal Medicine (*Internal Medicine*)
- Uniyime Nseyo, M.D., Assistant Professor in Residence (*Urology*)
- Martha O'Donnell, Ph.D., Assistant Adjunct Professor (*Human Physiology*)
- Lois F. O'Grady, M.D., Professor (*Internal Medicine*)
- Ronan O'Rahilly, M.D., Professor Emeritus (*Human Anatomy, Neurology*)
- Richard H. Oi, M.D., Professor of Clinical Obstetrics and Gynecology (*Obstetrics and Gynecology, Pathology*)
- Claude Organ, M.D., Professor in Residence (*Surgery*)
- Rosemary A. Orgren, Ph.D., Assistant Adjunct Professor (*Community Health*)
- James W. Overstreet, M.D., Ph.D., Professor (*Human Anatomy, Obstetrics and Gynecology*)
- John M. Palmer, M.D., Professor Emeritus (*Urology*)
- Phillip E.S. Palmer, M.D., F.R.C.P., Professor (*Radiology*)
- Demosthenes Pappagianis, M.D., Ph.D., Professor (*Medical Microbiology and Immunology*)
- Mark Parrish, M.D., Associate Professor (*Pediatrics*)
- Andrew Parsons, M.B.B.S.
- Gibbe H. Parsons, M.D., Professor (*Internal Medicine*)
- Hugh Patterson, Ph.D., Lecturer (*Human Anatomy*)
- Edith Perez, M.D., Assistant Professor of Clinical Internal Medicine (*Internal Medicine*)
- Stephen Phillips, M.D., Assistant Professor in Residence (*Internal Medicine*)
- Stephen D. Phinney, M.D., Ph.D., Assistant Professor in Residence (*Internal Medicine*)
- Neville R. Pimstone, M.D., Professor (*Internal Medicine*)
- Virginia C. Poirier, M.D., Assistant Professor of Clinical Radiology (*Clinical Radiology*)
- Jerry Powell, M.D., Associate Professor in Residence (*Internal Medicine*)
- Thomas P. Prindiville, M.D., Assistant Professor in Residence (*Internal Medicine*)
- George T. Rab, M.D., Professor (*Orthopaedic Surgery*)
- Lawrence Rabinowitz, Ph.D., Professor (*Human Physiology*)
- Antolin Raventos, M.D., Professor in Residence (*Radiology*)
- Stanley B. Reich, M.D., Professor in Residence (*Radiology*)
- Ted W. Reid, Ph.D., Professor in Residence (*Ophthalmology*)
- Michael Reinhart, M.D., Associate Professor of Clinical Pediatrics (*Clinical Pediatrics*)
- John A. Reitan, M.D., Professor (*Anesthesiology*)
- Michael P. Remler, M.D., Professor in Residence (*Neurology*)
- Eugene M. Renkin, Ph.D., Professor (*Human Physiology*)
- Kenneth J. Rhee, M.D., Assistant Professor of Clinical Internal Medicine (*Internal Medicine*)
- Mack Roach, M.D., Assistant Professor in Residence (*Diagnostic Radiology*)
- Dick L. Robbins, M.D., Professor (*Internal Medicine*)
- John A. Robbins, M.D., Associate Professor of Clinical Internal Medicine (*Clinical Internal Medicine*)
- Juan J. Rodrigo, M.D., Professor (*Orthopaedic Surgery*)
- Nicholas Rosenlicht, M.D., Assistant Professor in Residence (*Psychiatry*)
- Carl J. Rosenquist, M.D., Professor (*Radiology*)
- Alan M. Roth, M.D., Professor (*Ophthalmology, Pathology*)
- Robert B. Rucker, Ph.D., Professor (*Biological Chemistry*)
- Boris Ruebner, M.D., Professor (*Pathology*)
- Liisa Russell, M.D., Assistant Professor (*Pathology*)
- John Rutledge, M.D., Associate Professor in Residence (*Internal Medicine*)
- Amira Safwat, M.B.B.C.A., Professor of Clinical Anesthesiology (*Clinical Anesthesiology*)
- Steven J. Samuels, Ph.D., Associate Adjunct Professor (*Internal Medicine, Obstetrics and Gynecology*)
- Ethelda N. Sassenrath, Ph.D., Associate Professor in Residence Emeritus (*Psychiatry*)
- Marc B. Schenker, M.D., Associate Professor (*Internal Medicine*)
- Thomas W. Schleich, Ph.D., Adjunct Professor (*Chemistry*)
- Barbara Schöneeman, Ph.D., Professor (*Internal Medicine*)
- Phillip Schneider, M.D., Ph.D., Associate Professor in Residence (*Surgery*)
- Scott R. Schulman, M.D., Assistant Professor of Clinical Anesthesiology, Pediatrics (*Anesthesiology, Pediatrics*)
- Ivan Schwab, M.D., Associate Professor of Clinical Ophthalmology (*Ophthalmology*)
- Marshall Z. Schwartz, M.D., Professor (*Surgery*)
- Robert J. Scibienski, Ph.D., Associate Professor (*Medical Microbiology and Immunology*)
- Robert P. Scobey, Ph.D., Professor (*Human Physiology, Neurology, Ophthalmology*)
- Sidney A. Scudder, M.D., Assistant Professor in Residence (*Hematology, Oncology*)
- James A. Seibert, Ph.D., Associate Professor in Residence (*Radiology*)
- Craig W. Senders, M.D., Assistant Professor (*Otolaryngology*)
- Masud Seyal, M.B.B.S., Associate Professor (*Neurology*)
- Azad A. Sheikh, M.B.B.S., Assistant Professor of Clinical Pediatrics (*Pediatrics*)
- Allan D. Siefkin, M.D., Associate Professor of clinical Internal Medicine (*Internal Medicine*)
- Karen A. Sigvardt, Ph.D., Associate Adjunct Professor (*Neurology*)
- Joseph Silva, M.D., Professor (*Internal Medicine*)
- Helayne Silver, M.D., Assistant Professor in Residence (*Obstetrics and Gynecology*)
- Robert Slotnick, M.D., Assistant Professor in Residence (*Obstetrics and Gynecology*)
- Lloyd Smith, M.D., Assistant Professor in Residence (*Obstetrics and Gynecology*)
- Robert E. Smith, Ph.D., Associate Professor (*Human Physiology*)
- Elizabeth M. Smithwick, M.D., Professor (*Pediatrics*)
- J. Stuart Soeldner, M.D., Professor (*Internal Medicine*)
- Robert C. Stadalnik, M.D., Professor (*Radiology*)
- Larry G. Stark, Ph.D., Professor (*Pharmacology*)

Charles L. Stebbins, Ph.D., Assistant Professor in Residence (*Internal Medicine, Human Physiology*)
 David Steinberg, M.D., Assistant Professor in Residence (*Orthopaedic Surgery*)
 Judith Stern, Ph.D., Professor (*Internal Medicine*)
 Thomas Stevenson, M.D., Associate Professor (*Surgery*)
 Margaret S. Steward, Ph.D., Professor (*Psychiatry*)
 Dennis Stewart, Ph.D., Assistant Adjunct Professor (*Obstetrics and Gynecology*)
 Elma S. Stewart, F.N.P., Lecturer (*Family Practice*)
 Anthony R. Stone, M.D., Assistant Professor (*Urology*)
 Robert E. Stowell, M.D., Ph.D., Professor Emeritus (*Pathology*)
 Dale Strawn, M.D., Assistant Professor in Residence (*Surgery*)
 Dennis Styne, M.D., Professor (*Pediatrics*)
 Arthur Swislocki, M.D., Assistant Professor in Residence (*Internal Medicine*)
 Glenn T. Syftestad, Ph.D., Associate Professor in Residence (*Orthopaedic Surgery*)
 Jonathan Sykes, M.D., Assistant Professor of Clinical Otolaryngology (*Otolaryngology*)
 Michael Syvanen, Ph.D., Professor (*Medical Microbiology and Immunology*)
 Robert M. Szabo, M.D., Associate Professor (*Orthopaedic Surgery*)
 Robert C. Tait, Ph.D., Assistant Adjunct Professor (*Neurology*)
 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*)
 James D. Thurston, M.D., Assistant Professor of Clinical Anesthesiology (*Anesthesiology*)
 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*)
 John D. Trelford, M.D., Professor (*Obstetrics and Gynecology*)
 George Triadafilopoulos, M.D., Assistant Professor in Residence (*Internal Medicine*)
 Joann M. Trolinger, M.H.S., Lecturer (*Family Practice*)
 Frederic A. Troy II, Ph.D., Professor (*Biological Chemistry*)
 Walter Trudeau, M.D., Professor of Clinical Internal Medicine (*Internal Medicine*)
 Joe P. Tupin, M.D., Professor (*Psychiatry*)
 C. John Tupper, M.D., Professor Emeritus (*Community Health, Internal Medicine, Family Practice*)
 Judith L. Turgeon, Ph.D., Professor (*Human Physiology*)
 Patrick L. Twomey, M.D., Associate Professor in Residence (*Surgery*)
 Richard J. Valente, M.D., Assistant Professor of Clinical Internal Medicine (*Internal Medicine*)
 Judith Van de Water, Ph.D., Lecturer (*Internal Medicine*)
 David Vera, Ph.D., Assistant Adjunct Professor (*Radiology*)
 Zakauddin Vera, M.D., Associate Professor (*Internal Medicine*)
 Vijaya K. Vijayan, M.D., Ph.D., Professor (*Human Anatomy, Neurology*)
 Amparo Villablanca, M.D., Assistant Professor of Clinical Internal Medicine (*Internal Medicine*)
 John Vogel, M.D., Senior Lecturer (*Radiology*)
 Philip J. Vogt, M.D., Assistant Professor of Clinical Pathology (*Clinical Pathology*)
 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*)
 Worden Waring, Ph.D., Professor Emeritus (*Physical Medicine and Rehabilitation*)

Edward J. Watson-Williams, M.D., Professor Emeritus of Clinical Internal Medicine (*Clinical Internal Medicine*)
 Phillip G. Weller, M.D., Professor of Clinical Community Health (*Clinical Community Health*)
 Jeanna Welborn, M.D., Assistant Professor in Residence (*Internal Medicine*)
 Sefton R. Wellings, M.D., Ph.D., Professor Emeritus (*Pathology*)
 Richard P. Wennberg, M.D., Professor (*Pediatrics*)
 William Wenner, M.D., Assistant Professor in Residence (*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*)
 Mark Wheeler, M.D., Assistant Professor in Residence (*Pediatrics*)
 Thomas P. Whetzel, M.D., Assistant Professor in Residence (*Surgery*)
 David A. White, M.D., Associate Professor (*Anesthesiology*)
 Lynda L. White, M.H.S., Lecturer (*Family Practice*)
 Richard H. White, M.D., Professor of Clinical Internal Medicine (*Internal Medicine*)
 Connie Whiteside, M.D., Associate 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*)
 Mark C. Williams, M.D., Assistant Professor in Residence (*Obstetrics and Gynecology*)
 Lowell D. Wilson, M.D., Ph.D., Professor (*Internal Medicine, Biological Chemistry*)
 Garen Wintemute, M.D., Associate 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*)
 Marcie J. Woolsey, Ph.D., Lecturer (*Human Anatomy*)
 Reen Wu, Ph.D., Associate Professor in Residence (*Internal Medicine*)
 Hiroshi Yamauchi, M.D., Professor Emeritus (*Clinical Internal Medicine*)
 Julian R. Youmans, M.D., Ph.D., Professor (*Neurological Surgery*)
 Jerome Zeldis, M.D., Associate Professor (*Internal Medicine*)
 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 emer-

gency medicine. The second-year program is for four quarters, but with the Summer Quarter abbreviated to six weeks. The Summer Quarter provides a transition between basic and clinical sciences with the presentation of systematic pathology, and courses on the integumentary system and reproductive system. In the remaining three quarters, the students complete their training in basic sciences (pharmacology, microbiology) and are then, from an organ system approach, presented the pathophysiological basis of disease (endocrine, hematopoietic/lymphoreticular, gastrointestinal, nutrition, musculoskeletal, neuromuscular, respiratory, nephrology). During the second year, students continue training in physical diagnosis, are introduced to laboratory diagnostic techniques, and are presented with issues in community health, occupational medicine, psychopathology, and human sexuality. The third-year program is comprised of required clerkship rotations in the clinical specialties: twelve weeks of surgery, twelve weeks of medicine, and eight weeks each of obstetrics/gynecology, pediatrics and psychiatry.

In the fourth year of the M.D. curriculum, flexibility is built in to allow students to begin to individualize their medical career. Twenty-four weeks of flexible clerkships include four weeks of neurology and/or neurosurgery, four weeks of ambulatory care, and sixteen weeks of clinical selectives. Each student is required to take two-week clerkships in physical medicine and rehabilitation, ophthalmology, otolaryngology, and a two-week required experience in responsibilities of medical practice (medical ethics, jurisprudence, medical economics). The fourth year curriculum also allows for twelve weeks of undesignated time.

To satisfy the M.D. degree program, the student must successfully complete the required course work and clerkships. Students who enter the program with advanced training in one of the areas required for the program are permitted to substitute required courses with electives of equal credit. In addition to the fourth-year elective program available, there is some opportunity for selecting electives during the first two years, in particular during the interim period between the first and second years.

First-Year Required Courses

UNITS

Quarter I: Fall

Biological Chemistry 410A, molecular and cell biology.....4.5
 Family Practice 400A, introduction to patient evaluation.....2
 Cell Biology and Human Anatomy 400, developmental, gross and radiologic anatomy.....9
 Psychiatry 401, medicine and the mind.....2

Quarter II: Winter

Biological Chemistry 410B, cell biology and metabolism3.5
 Cell Biology and Human Anatomy 402, human microscopic anatomy.....5
 Human Physiology 400, human physiology.....8
 Family Practice 400B, introduction to patient evaluation.....2

Quarter III: Spring

Biological Chemistry/Human Physiology 418, mammalian endocrinology and homeostasis4.5
 Human Anatomy/Human Physiology 403, neurobiology.....5
 Medical Microbiology 480A, basic and medical immunology2.5
 Pathology 411, Pathology I5
 Family Practice 400C, introduction to patient evaluation.....2

Second-Year Required Courses

Quarter IV: Summer

Pathology 423, Pathology II7.5
 Obstetrics and Gynecology/Pediatrics 420, reproduction/genetics/perinatology.....2
 Dermatology 420, integumentary system2

*Course not offered this academic year.

Internal Medicine 400A, physical diagnosis.....1

Quarter V: Fall

Medical Microbiology 480B, pathogenic microbiology.....6.5

Internal Medicine 420A, hematopoietic and lymphoreticular system/nuclear medicine.....5

Orthopaedic Surgery 420, musculoskeletal system.....2.5

Medical Pharmacology and Toxicology 400A, Principles of Pharmacology A.....2.5

Community Health/Internal Medicine 402, epidemiology/community health/occupational medicine.....2.5

Internal Medicine 400B, physical diagnosis.....2

Quarter VI: Winter

Medical Pharmacology and Toxicology 400B, Principles of Pharmacology B.....6

Internal Medicine 420C, respiratory system.....4

Internal Medicine 420D, cardiovascular system.....3.5

Psychiatry 403, psychopathology.....3.5

Psychiatry 402, human sexuality.....1

Internal Medicine 400C, physical diagnosis.....2

Quarter VII: Spring

Internal Medicine 420F, metabolic-regulatory system.....3.5

Internal Medicine 420B, gastrointestinal system.....3

Internal Medicine/Biological Chemistry 419, basic and clinical nutrition.....2

Internal Medicine 420E, nephrology.....4

Neurology 420, neuromuscular pathophysiology.....4

Internal Medicine 400D, physical diagnosis.....2

Third-Year Required Courses

Medical Sciences (core courses)

Professional Courses

430. Required Surgery Clerkship (18) I, II, III, IV. The Staff

Clinical activity—full time (eight weeks); lecture—8 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. Restricted to medical students. Course consists of eight weeks of general surgery specialties and four weeks of orthopedics or urology. Core material is presented through seminars and lectures and reading assignments involving the workup and care of the surgical patient. The clerkship is given both at UCDMC and at Martinez VA Hospital.

431. Medicine Clerkship (18) I, II, III, IV. Course Committee Chairperson

Clinical activity—full time (12 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 6-week periods, one each at UCD Medical Center and at Martinez VA Hospital. Direct patient care situations under guidance of full-time or volunteer faculty member. Nights and weekend on-call. Completion of 24 full write-ups on patients for whom student will take special responsibility.

432A. Obstetrics-Gynecology Clerkship (12) I, II, III, IV. Course Committee Chairperson

Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Obstetric/neonatal/gynecologic experience in delivery room, nursery wards, operating room, clinics. One-third of time spent in gynecology, two-thirds of time in perinatology. Obstetrics, neonatology and continuing care of fetus-neonate emphasized in perinatal period. Seminars and conferences throughout period.

432B. Pediatric Clerkship (12) I, II, III, IV. Course Committee Chairperson

Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 4-week periods, one in inpatient rotation (UCD Medical Center or Travis AFB) and one in ambulatory experience (UCD

Medical Center). Assumption of appropriate patient care responsibilities; participation in conference/rounds; and seminars during ambulatory rotation.

433. Clinical Clerkship in Psychiatry (12) I, II, III, IV. Course Committee Chairperson

Clinical activity—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Students assigned to various mental health clinical settings following intensive orientation program. Focus on treatment of psychiatric problems encountered by physician in practice. Diagnostic, therapeutic, and interpersonal skills emphasized.

440. Responsibilities of Medical Practice (3) II. Davidson and staff

Lecture/discussion—60 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. Students will address nonbiological components of the patient-physician relationship (medical ethics, medical jurisprudence, medical economics, alcoholism and drug abuse, etc.) and critically explore social, ethical and cultural issues arising in medical practice. (S/U grading only.)

Fourth Year Requirements

Fourth Year Required Courses

Responsibilities of medical practice.....2 weeks

Physical Medicine and Rehabilitation clerkship.....2 weeks

Ear, Nose and Throat/Ophthalmology clerkships.....4 weeks

Fourth Year Flexible Clerkships

Neurology and/or Neurosurgery.....4 weeks

Ambulatory Care.....4 weeks

Clinical Selectives.....16 weeks

The fourth year curriculum also allows for twelve weeks of undesignated time (electives, interviews, free time, etc.)

Other Medical Sciences Courses

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. Walsh

Lecture—1 hour. Prerequisite: medical students in good standing. Clinical research presented by School of Medicine faculty; overview of pertinent issues, including medical ethics, human subjects protocols, case control methods, etc. (S/U grading only.)

489. Directed Studies (9) IV. O'Grady

Independent study—40 hours weekly. Prerequisite: individual directed studies in extended preparation for National Board Examination, Part I, and/or as required by Promotion Board. Independent studies to review material from Years I and II in the curriculum in preparation for taking National Boards in the fall, and for remediation course work directed by the Promotion Board. Students are expected to spend 8 to 12 hours per day on these studies. Faculty consultation and tutoring available on individual basis. (S/U grading only.)

Departmental Courses:

Anesthesiology

Upper Division Course

192. Internship in Anesthesiology (1-6) I, II, III, IV. The Staff (Bennett, Kien)

Internship—3 to 18 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in anesthesia and related fields. (P/NP grading only.)

Professional Courses

420. Case Management Conference (1) I, II, III, IV. The Staff

Discussion—1 hour. Prerequisite: interns and residents, advanced medical and veterinary students; consent of instructor. Informal discussion of current hospital case material presented by house officers, students and faculty. Clinical and research experience, combined with pertinent literature references, is brought to bear on the problems with emphasis on preventative as well as corrective measures.

421. Basic Science Conference (1) I, II, III, IV. The Staff (White in charge)

Discussion—1 1/2 hours. Prerequisite: advanced medical, veterinary, and graduate students; consent of instructor. Approved for graduate degree credit. 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. (Loeb in charge)

Full-time clinical activity (3 full days per unit). Prerequisite: third- and fourth-year medical students. Provides experience in total anesthetic management including application of physiologic and pharmacologic principles to preoperative, operative and post-operative management of patients. Considers choice and management of general and regional anesthesia techniques, resuscitation, artificial ventilation, inhalation and fluid-electrolyte therapy and pain problems. Students electing portions of the course for credit, must receive consent of instructor. Limited enrollment.

***461. Anesthesia Surgical Team Participation:**

Martinez VA Medical Center (6-9) I, II, III, IV. Irwin

Clinical activity—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) III, IV. (Loeb in charge)

Clinical activity—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 activity—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 con-

sent 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

Internship—3-36 hours; final report. Supervised work experience in biological chemistry and related fields. (P/NP grading only.)

Upper Division Courses

192. Internship in Biological Chemistry (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to internship by preceptor. Supervised work experience in Biological Chemistry and related fields. (P/NP grading only.)

198. Group Study (1-5) I, II, III, IV. The Staff

Prerequisite: consent of instructor. For undergraduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

209. Prostaglandins/Leukotrienes and Related Lipids (2) II. Ziboh (Dermatology)

Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B or Physiology 100A-100B. Oxidative desaturation/elongation of polyunsaturated fatty acids. Biosynthesis of prostaglandins/leukotrienes from polyunsaturated fatty acids. Chemistry, biochemistry, and metabolism. Nutritional regulation. Physiological/pathophysiological implications; pharmacological and clinical relevance. Offered in alternate years.

214. Contemporary Medical Biochemistry (1) II. The Staff

Discussion—1 hour. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance, and are intended to be of interest to medical students. (S/U grading only.) (Same course as 414.)

***216. Protein Structure (3)** II. Benisek

Lecture—3 hours. Prerequisite: Biochemistry 201A or consent of instructor. Course designed to acquaint students at graduate level with currently applied techniques employed in determination of protein structure and significant results derived from them. Techniques which will be presented include amino acid sequence analysis, three-dimensional structure determination by X-ray diffraction, and nuclear magnetic resonance spectroscopy. Offered in alternate years. (S/U grading only.)

217. Molecular Genetics of Fungi (3) II. Holland

Lecture—3 hours. Prerequisite: graduate standing in a biological science; Biochemistry 101B; Genetics 100, 102A; Botany 119; Plant Pathology 130, 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. (Same course as Plant Pathology 217.)

222. Mechanisms of Translational Control (2) II.

Hershey

Lecture—1 hour; discussion—1 hour. Prerequisite: Biochemistry 201C or consent of instructor. Molecular mechanisms of protein synthesis and translational control in eucaryotic cells, with emphasis on mammalian cells and their viruses. An advanced graduate-level treatment of topics of current interest, with readings and discussion of primary papers from the literature. Offered in alternate years.

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

Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved.

299. Research (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

410A. Molecular and Cell Biology (4.5) I. Matthews, Holland

Lecture—5 hours. Basic biochemistry of proteins and nucleic acids is presented, followed by molecular genetics, regulation of gene expression, enzymes and structural proteins. Applications to clinically relevant systems are emphasized, particularly sickle cell anemia, thalassemias, immunoglobulins and monoclonal antibodies, oncogenes, cell proliferation control.

410B. Cell Biology and Metabolism (3.5) II. Traut

Lecture—4 hours (for 9 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. Introduction to transport of small molecules and ions across membranes is followed by study of energy metabolism and biosynthetic processes in humans. Membrane receptors are considered as they relate to basic metabolic processes. Correlations to human disease are made throughout.

414. Contemporary Medical Biochemistry (1) II.

The Staff

Discussion—1 hour. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance, and are intended to be of interest to medical students. (S/U grading only.) (Same course as 214.)

418. Mammalian Endocrinology and Homeostasis (4.5) III. Walsh and staff

Lecture—4 hours; discussion—1 hour; student presentation. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiological and biochemical properties of the mammalian endocrine system both at the cellular and systemic level. Principles that regulate homeostasis, especially in organ-organ interrelationships, metabolites, and minerals. Reproductive endocrinology. (Same course as Human Physiology 418.)

419. Introduction to Clinical Nutrition (3) III. Halsted (Internal Medicine), Rucker, and staff

Lecture—5 hours; Lecture/discussion—1.5 hours; laboratory/discussion—0.5 hour (over a 4-week period). Prerequisite: approval by Committee on Student Evaluation and Promotion. A 28-hour course that integrates basic and clinical concepts of human nutrition. The course emphasizes nutrient homeostasis and regulation and current perspectives on the role of nutrition in disease. Format is partly lectures, partly discussion/case study. (Same course as Internal Medicine 419.)

497T. Tutoring in Biological Chemistry (1-5) I, II, III, IV. The Staff

Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: medical students with consent of instructor. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: medical students with consent of instructor. (S/U grading only.)

Cell Biology and Human Anatomy

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (4) II. Patterson

Lecture—4 hours. Prerequisite: Biological Sciences 1A or 10; Physiology 2-2L or Biological Sciences 1B recommended. A study of the gross and microscopic structure of the human body with emphasis on function.

101L. The Gross and Microscopic Structure of the Human Body (2) II. Patterson

Laboratory—two 3-hour sessions. Prerequisite: course 101 (may be taken concurrently). Laboratory will be taught from prosections, models and slides to give students the opportunity to learn structure from direct experience.

192. Internship in Morphology (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; laboratory science experience including some chemistry; approval of project by preceptor prior to period of internship. Experience of supervised internship in research laboratories of members of the department. (P/NP grading only.)

197T. Tutoring in Cell Biology and Human Anatomy (1-5) II. The Staff

Discussion—1 hour; laboratory—6-9 hours. Prerequisite: completion of course 101 with a grade of B or better and consent of instructor. Provides laboratory instruction in gross and microscopic human anatomy, with small groups of undergraduates under the supervision of the instructor. (S/U grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Discussion—1-10 hours. Prerequisite: consent of instructor. Directed reading, discussion, and/or laboratory experience on selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Gross Anatomy (8) I. Patterson

Lecture—3.5 hours; discussion—1 hour; laboratory—10.5 hours. Prerequisite: graduate student status and consent of instructor. To provide students with a vocabulary of human body structure and to acquaint them with structural relationships through dissection and lecture and to introduce them to functional aspects of gross anatomy, particularly as regards anatomical problem solving.

202. Human Microscopic Anatomy (5) II. Meizel

Lecture—3 hours; laboratory—6 hours. Examines the normal microscopic structure of the basic cells, tissues, and organs of the body. Lectures emphasize morphology and structure-function relationships. Accompanying laboratories involve analysis and identification of sectioned material at the light microscopic and ultrastructural levels.

203. Neurobiology (6) III. Vijayan

Lecture—5 hours; laboratory—3 hours. Prerequisite: consent of instructor. Gross and microscopic anatomy of the central nervous system; motor and sensory pathways; neurophysiology, and cognitive functions.

290. Seminar (1) I, III. The Staff

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: graduate student with research experience (may be taken concurrently); consent of instructor. Discussion of problems, progress and literature relevant to current research undertaken by laboratory groups in Human Anatomy. (S/U grading only.)

292. Fertilization and Gamete Literature Critique

(1) I, II, III. Meizel

Discussion—1 hour. Prerequisite: consent of instructor. Critical evaluation of current journal articles dealing with cell biology and biochemistry of gametes and fertilization. Selected papers will be presented and discussed in detail by students and faculty. May be repeated for credit. (S/U grading only.)

298. Advanced Group Study (1-5) I, II, III, IV. The Staff

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses**400. Developmental, Gross, and Radiologic Anatomy (9) I. Patterson and staff**

Lecture—6 hours; laboratory—12 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Integrated presentation of developmental, gross, and radiologic anatomy. Four students are assigned to a cadaver and dissect the entire body. Embryology and radiology are correlated with the dissections. Embryology is covered from implantation to birth.

402. **Human Microscopic Anatomy (5) II. Meizel and staff**
Lecture—3 hours; laboratory—6 hours. Prerequisite: Approval by committee on Student Evaluation and Promotion. Examines the normal microscopic structure of the basic cells, tissues, and organs of the body. Lectures emphasize morphology and structure-function relationships. Accompanying laboratories involve analysis and identification of section material at the light microscopic and ultrastructural levels.

403. Neurobiology (5) III. Vijayan

Lecture—4 hours; laboratory—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiology and anatomy of the normal human nervous system in an integrated format. Focus on gross and microscopic brain structure, functional neuroanatomy, and the physiology, biochemistry, and pharmacology of the nervous system. (Same course as Human Physiology 403.)

404. 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.)

405. 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.)

406. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Clinical Psychology**Graduate Course****299. Research (1-12) I, II, III, IV. Steward**

Prerequisite: graduate student in Clinical Psychology or consent of instructor. Individual or group research on selected topics. (S/U grading only.)

Community 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. **Internship 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**
Clinical activity—3-15 hours; written report. Prerequisite: upper division student standing. The undergraduate student, through active participation in the medical aspects of community health clinics, gains knowledge of their organization, administration, and problem solving capabilities of these primary care facilities. (P/NP grading only.)

195. **International Health Care (1) I. Orgren**
Seminar—1 hour. Prerequisite: one or more courses in community health, health policy, sociology, or international relations recommended. Presentation of current health issues and health care systems in other countries. Topics include health care for refugees, the impact of political strife on health, the role of the health care professional in international settings. May be repeated for credit. (P/NP grading only.)

198. **Directed Group Study (1-5) I, II, III, IV. The Staff**
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. **Special Studies in Community Health (1-5) I, II, III, IV. The Staff**
Prerequisite: advanced undergraduate standing and consent of instructor. Directed individual 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**
Clinical activity—3-15 hours. Prerequisite: open to all first- or second-year medical students, or graduate students with consent of instructor. Students are assigned to clinical settings which demonstrate ethnic, urban/rural or other related aspects of clinical community health. The students, through active participation in health care delivery, are able to relate conceptual with practical aspects of primary health care. (S/U grading only for graduate students.)

298. **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. Orgren, Weiler, Tupper**
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.)

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.

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.

421. **Principles of Epidemiology, Occupational Medicine, and Geriatrics (2.5) I. Schenker, Weiler**
Lecture—7.5 hours for 4 weeks; discussion—1.5 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamentals of epidemiology and epidemiologic study design, including measures of morbidity, mortality, and risk. Occupational medicine component covers the evaluation of occupational illness, and specific examples of occupational diseases. Geriatrics component covers the comprehensive geriatric assessment, treatment issues, and the long-term care system. (Same course as Internal Medicine 421.)

455. **Multidisciplinary Clinical Preceptorship (4.5) IV. Orgren**
Clinical activity—full time (3 weeks). Prerequisite: second-year student in good academic standing. Students will be introduced to basic principals of geriatric health care and provided with opportunities for clinical observation and experience in a variety of facilities that serve older adults. Multidisciplinary nature of geriatrics will be emphasized. (S/U grading only.)

460. **Geriatrics in Community Health (6-12) I, II, III, IV. 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 infirm. Sites include Yolo, Sacramento, and Martinez counties.

461. **Group Practice in Community Health (6-18) I, II, III, IV. Borhani**
Prerequisite: third- or fourth-year medical students. Clinical preceptorships in ten-man private rural group practice. Southern Monterey County Medical Group, King City, California. Group demonstrates "one door" medical care for private and indigent farm labor families. (HEW Grant.)

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 activity—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

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.

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.

421. Principles of Epidemiology, Occupational Medicine, and Geriatrics (2.5) I. Schenker, Weiler

Lecture—7.5 hours for 4 weeks; discussion—1.5 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamentals of epidemiology and epidemiologic study design, including measures of morbidity, mortality, and risk. Occupational medicine component covers the evaluation of occupational illness, and specific examples of occupational diseases. Geriatrics component covers the comprehensive geriatric assessment, treatment issues, and the long-term care system. (Same course as Internal Medicine 421.)

455. Multidisciplinary Clinical Preceptorship (4.5) IV. Orgren

Clinical activity—full time (3 weeks). Prerequisite: second-year student in good academic standing. Students will be introduced to basic principals of geriatric health care and provided with opportunities for clinical observation and experience in a variety of facilities that serve older adults. Multidisciplinary nature of geriatrics will be emphasized. (S/U grading only.)

460. Geriatrics in Community Health (6-12) I, II, III, IV. 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 infirm. Sites include Yolo, Sacramento, and Martinez counties.

461. Group Practice in Community Health (6-18) I, II, III, IV. Borhani

Prerequisite: third- or fourth-year medical students. Clinical preceptorships in ten-man private rural group practice. Southern Monterey County Medical Group, King City, California. Group demonstrates "one door" medical care for private and indigent farm labor families. (HEW Grant.)

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 activity—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

Internship—8-20 hours; final report. Prerequisite: upper division standing or consent of instructor. Approval of project prior to internship by preceptor. Supervised work experience involving research on the skin. (P/NP grading only.)

199. Special Study in Cutaneous Biology (1-4) I, II, III, IV. The Staff (Isseroff in charge)

Prerequisite: advanced undergraduate standing and/or consent of instructor. Special study by individual arrangement of specialized topics in biology of skin. Work may be assigned readings, laboratory research or a combination. (P/NP grading only.)

Graduate Course

299. Research in Cutaneous Biology (1-12) I, II, III, IV. The Staff (Isseroff in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Independent research in cellular and biochemical mechanisms of cutaneous biology and pathology. (S/U grading only.)

Professional Courses

420. Integumentary System (2) IV. Huntley and staff
Lecture/discussion—4 hours (for 6 weeks). Prerequisite: approval by Committee on Student Evaluation and Promotion. Covers cell biology, pathology, and physical diagnosis of the skin and is designed to prepare medical students for clinical service. Recognition of normal variations, and common or important dermatoses is emphasized. Patient demonstrations of select conditions are included.

460. Dermatology Clinical Clerkship (6) I, II, III, IV. Isseroff

Clinical activity—40 hours for four weeks (inpatient/outpatient service). Prerequisite: completion of three years of medical school; or consent of instructor. Inpatient-outpatient service. Observation and participation in dermatology clinics/practice 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. Wheeland

Clinical activity—3-9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical experience limited to observation of delivery of dermatologic care and attendance at some conferences. (S/U grading only.)

498. Special Topics in Clinical Dermatology (1-6) I, II, III, IV. The Staff (Wheeland in charge)

Independent study—3-18 hours. Prerequisite: medical students with consent of instructor. Individually arranged study of special topics in clinical dermatology determined by student and instructor. Assigned readings and/or clinical examination of selected patients.

499. Research in Cutaneous Biology (1-12) I, II, III, IV. The Staff (Isseroff in charge)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Research, either laboratory or clinical, on ongoing projects within the department under supervision of faculty. (S/U grading only.)

Family Practice

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 cur-

rent 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

192A. Internship in Family Practice (1-12) I, II, III, IV. Davidson

Internship—3-36 hours. Prerequisite: upper division standing and consent of instructor. Work experience supervised in the Department of Family Practice. Upper-division students provided an opportunity to acquire research experience in a clinical laboratory setting. (P/NP grading only.)

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.)

195. Health Care to Underserved Populations (1) II. Nesbitt

Lecture—1 hour. Prerequisite: sociology, political science, or applied behavioral science background recommended, or registration in medical school. Discusses socio/cultural perspectives of underserved population in California impacting their health; roles of family/interpersonal relationships in making health care decisions; and clinician's perspectives in treating people of cultures which are unfamiliar and/or uncomfortable with Western medicine. (P/NP grading only.)

Professional Courses

The following courses are for students enrolled in the Family Nurse Practitioner/Physician Assistant Program.

340A-340B-340C-340D. Clinical Preceptorship for FNP/PAs (3-12) I-II-III-IV. Mentink, White

Clinical activity—8-40 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program. Student spends 8-40 hours per week with an approved physician preceptor in patient care to develop clinical skills necessary to assess and manage patients with common medical problems seen in primary care and long-term care facilities.

341A-341B-341C-341D. Advanced Clinical Preceptorship for FNP/PA Students (3-12) I-II-III-IV. Mentink and staff

Clinical activity—8-40 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program, and course 340A-340B-340C. Student spends 8 to 40 hours per week in an approved clinical setting to build on clinical skills in primary care learned in course 340A-340B-340C. Assessment and management of patients with complex and multiple problems.

343A-343B-343C-343D-343E-343F. Inpatient Clinical Experience for FNP/PA Students (5-5-5-5-5-5) I, II, III, IV. The Staff

Clinical activity—160 hours per quarter. Prerequisite: registered student in Family Nurse Practitioner/Physi-

cians Assistant Program; successful completion of course 340A-340B-340C. Student clerkship in the inpatient setting in Family Practice, Surgery, and medical/surgical subspecialty electives at UCDCM and/or affiliated institutions. Designed to expose the FNP/PA program student to inpatient management; acquaint student with FNP/PA role in inpatient setting. (P/NP grading only.)

345. Clinical Geriatrics (5) III. Higby

Clinical activity—15 hours. Prerequisite: registered student in Family Nurse Practitioner/Physicians Assistant Program. Application of principles of geriatric care in the outpatient, nursing home, acute hospital, and community settings that provide services for the elderly, including visits to patients' homes. (P/NP grading only.)

350. Ethics and Trends in Health Care for FNP/PAs (2) III. Trolinger

Lecture/discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Trends and ethical issues in health care, review of the process and policies for ethical decisionmaking in patient care. These issues, trends, and processes will be related to the role of the Family Nurse Practitioner/Physician Assistant.

352A-352B-352C. Professional Development of the Physician Assistant (1-1-1) I-II-III. Mentink 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 and legal considerations of the physician assistant.

354A-354B-354C. Fundamentals of Primary Health Care for FNP/PA Students (5-4-4) I-II-III. The Staff

Lecture/discussion—4-5 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program. Study of anatomy and physiology, pathophysiology, diagnostic criteria, approaches to assess and manage common medical problems seen in primary health care.

355A-355B-355C. Advanced Principles of Health Care for FNP/PA Students (4-4-4) I-II-III. Mentink and staff

Lecture/discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physicians Assistant Program; course 354A-354B-354C. Study of anatomy and physiology, pathophysiology, diagnostic criteria and approaches to assess and manage patients with complex and/or multiple health care problems in primary care settings, and to learn the management of patients in inpatient settings.

356. Pharmacology for FNP/PA Students (4) I-II-III. The Staff

Lecture/discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physicians Assistant Program. Principles of pharmacokinetics and pharmacodynamics, the classifications of drugs and representative drugs within each class, and application of these principles to pediatric and geriatric patients, and to pregnant or lactating women.

360A-360B-360C. Ethics and Trends in Health Care for FNP Students (1-1-1) I-II-III. Mentink and staff

Lecture/discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program or consent of instructor. The student will learn about trends and ethics in health care, and review process and policies for ethical decision-making in patient care. These issues, trends and processes will be related to the role of the Family Nurse Practitioner.

362A-362B-362C. Professional Development of the FNP (1-1-1) I-II-III. Mentink and staff

Lecture/discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program or consent of instructor. 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-364D-364E-364F. Behavioral Science for FNP/PA Students (2-1-1-1-1-1) I-II-III-I-II-

III. The Staff

Lecture/discussion—2-1-1-1-1-1 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Study of communication skills and interviewing techniques, of self-awareness and awareness of others, of assessment of patients' concerns and counseling skills to assist them to gain insight and reach their own solutions, of behavior modification concepts and techniques.

366A-366B-366C-366D. Family Practice and Community Health for FNP/PA Students (2-2-2-2) I-II-III-IV. Mentink and staff

Lecture/discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program. Study of family dynamics, growth and development, health care in all age groups including special concerns in pediatrics and geriatrics, health promotion and disease prevention, and cultural and community needs and concerns.

399. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. Davidson

Prerequisite: consent of instructor. Flexibility to develop and pursue research and clinical interests to enhance education in Family Practice. (P/NP grading only.)

Professional Courses**400A-400B-400C. Introduction to Patient Evaluation (2-2-2) I, II, III.** Callahan, Morgan

Lecture/discussion—18 hours total; clinical activity—6 hours total; conference or laboratory—4-8 hours total. Using a problem-based format and simulated patients each student will practice dealing with communication problems and learn basic physical examination skills through small group interactions. A continuity preceptorship and introduction to emergency medicine will also be offered. (Deferred grading only, pending completion of sequence.)

401. Preceptorship in Family Practice (1-9) I, II, III, IV. Morgan

Preceptorship—part-time (one 4-hour day per week; 10 weeks) or full-time (40-hour week per 1.5 units; 4 to 6 weeks). Prerequisite: medical students with consent of instructor. Student preceptorship in family physician's office as an introduction to clinical medicine.

402. Introductory Medical Spanish (2) II, III. Meizel

Lecture/discussion—2 hours. Prerequisite: restricted to medical students in good standing. Teaches the vocabulary needed to conduct a basic history and physical examination in Spanish. (S/U grading only.) (Deferred grading only, pending completion of sequence.)

407. Davis Community Clinic (2) I, II, III, IV. Tanji

Clinical activity—5-6 hours. Prerequisite: second-year medical student in good academic standing. Students learn to diagnose and treat common medical problems as seen at a community clinic, under the direct supervision of a physician. (S/U grading only.)

434A-434B-434C-434D-434E-434F-434G-434H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo

Clinical activity—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: first- and second-year (full-time) medical students with consent of instructor; pre-application processed. Exposure to episodic and acute disease; learn physical examination and taking a complete history; also learn immunization techniques, use of laboratory tests. Limited enrollment. (S/U grading only.)

435A-435B-435C-435D-435E-435F-435G-435H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo

Clinical activity—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: third- and fourth-year (full-time) medical students with consent of instructor; pre-application processed. Counseling, diagnosis, and treatment of patients with chronic (long-term) and acute (short-term) disease under supervision of a physician; 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. Scherger, Nesbitt

Clinical activity—full time (4 or 8 weeks). Prerequisite: third-year medicine clerkship. Ambulatory medicine experience in family practice setting. Acquisition of skills to evaluate and develop a treatment plan for patients with common medical problems seen by primary care physicians in the outpatient setting.

445. Sports Medicine from a Primary Care Perspective (6) I, II, III, IV. Tanji

Clinical activity—full time (4 weeks). Prerequisite: fourth-year medical student in good academic standing. Students spend full time in outpatient clinic settings in family practice, orthopaedic surgery, physical education, internal medicine, and a community private practice. Students learn principles and practice of sports medicine from a primary care perspective.

462. Family Practice Preceptorship (3-18) I, II, III, IV. Scherger

Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of medical school or medical student with consent of instructor. Preceptorships with primary care physicians in a variety of settings. Involvement in direct patient care and daily activities under supervision of physician-preceptor.

463. Selected Readings in Family Practice (1-9) I, II, III, IV. The Staff

Discussion—3-27 hours. Prerequisite: medical students in good academic standing. Increase understanding of family practice through assigned reading and thorough discussion with faculty member.

468. Family Practice in a Foreign Culture (6-18) I, II, III, IV. Scherger

Clinical activity. Prerequisite: completion of third year in medical school. Visit a family practitioner in a foreign country (arranged in advance by Department), accompany and participate in clinic activities of preceptor and analyze and report characteristics of the practice.

469. Family Practice Clerkship (3-18) I, II, III, IV. Nesbitt

Clinical activity—full-time. Prerequisite: third- and fourth-year medical students with consent of instructor (third-year students may elect to enroll for second half of spring quarter). Involvement in comprehensive primary medical care of patients in a family setting and observe the team approach to health care.

480. Insights in Family Practice (1-3) I, II, III, IV. Morgan, Scherger

Clinical activity—3 to 9 hours; required readings. Prerequisite: first, and second-year medical students in good academic standing; consent of instructor. Exposure to family practice in outpatient clinical setting. Three to nine hours per week spent with a community physician preceptor who is a member of the clinical faculty. (S/U grading only.)

498. Directed Group Study in Family Practice (1-9) I, II, III, IV. The Staff

Discussion—3-37 hours. Prerequisite: medical students with consent of instructor. Directed study on selected topics relating to family medicine and primary health care delivery; visits to and written analysis of selected innovative health care programs. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff

Prerequisite: medical students with consent of instructor. Research in various aspects of the health care delivery system. (S/U grading only.)

Human Physiology**Upper Division Courses****192. Internship in Human Physiology (1-12) I, II, III, IV.** The Staff (Renkin in charge)

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in physiology and related fields. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (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.** Curry, Renkin, and staff

Lecture—48 hours total; discussion—12 hours total. Prerequisite: graduate standing and consent of instructor. General cellular and organ system physiology, including neural, cardiovascular, respiratory, gastrointestinal and urinary systems in the human. Lectures concurrent with course 400; research-discussion and laboratory-demonstration sessions, and examinations separate.

210. Advanced General Physiology (3) III. Curry, Cala

Lecture—3 hours. Prerequisite: Physiology 100B; Biochemistry 101B; Chemistry 107B; graduate standing and consent of instructor. Physicochemical basis of living systems with emphasis on membrane permeability characteristics at both the cellular and tissue level. Offered in alternate years.

231. Renal Physiology (3) I. Rabinowitz

Lecture—3 hours. Prerequisite: Physiology 112, 113 or the equivalent; graduate standing. Topics in mammalian renal physiology and related areas of biological transport, fluid and electrolyte homeostasis, comparative renal physiology, and pathophysiology of the kidney in man. Offered in alternate years.

250. Circulatory Transport and Fluid Exchange (3) I. Renkin

Lecture—2 hours; discussion—1 hour. Prerequisite: Physiology 112-113-114 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 alternate 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 alternate years.

261. Simulation of Physiological Systems (1-3) I,

II, III, IV. Smith
Laboratory—3-9 hours. Prerequisite: course 260 or the equivalent; consent of instructor. Selected problems in simulation of physiological control systems. Simulations performed on current microcomputer hardware using high level simulation languages. Problems may be selected from literature or from student's research; experimental testing of the simulation encouraged.

280. Pulmonary Function Evaluation (4) I, II, III.

Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 480.)

285. Peripheral Circulation (3) III. Gray

Lecture—1 hour; discussion—2 hours. Prerequisite: Physiology 111B, 113, 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 alternate 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. Curry, Renkin, and staff

Lecture—6 hours; laboratory—6 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. General, cellular and systemic physiology of cardiovascular, respiratory, gastrointestinal and urinary systems.

403. Neurobiology (5) III. Vijayan

Lecture—4 hours; laboratory—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiology and anatomy of the normal human nervous system in an integrated format. Focus on gross and microscopic brain structure, functional neuroanatomy, and the physiology, biochemistry, and pharmacology of the nervous system. (Same course as Cell Biology and Human Anatomy 403.)

418. Mammalian Endocrinology and Homeostasis (4.5) III. Walsh and staff

Lecture—4 hours; discussion—1 hour; student presentation. Prerequisite: approval by Committee on Student Evaluation and Promotion. Physiological and biochemical properties of the mammalian endocrine system both at the cellular and systemic level. Principles that regulate homeostasis, especially in organ-organ interrelationships, metabolites, and minerals. Reproductive endocrinology. (Same course as Biological Chemistry 418.)

480. Pulmonary Function Evaluation (4) I, II, III. Cross

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 280.)

497T. Tutoring in Human Physiology (1-5) I, II, III, IV. 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—2-8 hours. Prerequisite: medical student. Directed reading and discussion on selected topics in human physiology. (S/U grading only.)

499. Research (1-6) I, II, III, IV. Renkin and staff

Prerequisite: medical students with consent of instructor. Laboratory investigation on selected topics. (S/U grading only.)

Internal Medicine

Upper Division Courses

192. Internship in Internal Medicine (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final report. Prerequisite: upper division standing. Supervised work experience in internal medicine and related fields. (P/NP grading only.)

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.)

Graduate Course

250. An Introduction to Clinical Research Design and Epidemiology (3) I. Schenker, Hirsch, Faculty Division of General Medicine

Lecture—1 hour; discussion—2 hours. Prerequisite: open to clinicians and those interested in gerontological research; graduate or post-graduate standing with consent of instructor; introductory statistics at

undergraduate or graduate level. Students will learn basic clinical research design by preparing an original research proposal in parallel with lectures and readings. Small discussion groups organized by field of interest will allow students to receive constructive feedback on their proposals. (S/U grading only)

290. Topics in Molecular Medicine (1) I, II, III, IV. Lawrence

Discussion—1 hour. Prerequisite: graduate student standing and consent of instructor. Reading and discussion of major advances in the molecular biology aspects of medicine. Students and staff will choose and present molecular biology papers from basic research journals. Emphasis will be on new applications of recombinant DNA technology to medicine and applied basic research. (S/U 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.

401A-401B-401C-401D. Physical Diagnosis

Practicum B (1-2-2-2) I, II, III, IV. Foulke
Fieldwork—2 hours; lecture—1 hour; laboratory/discussion—1 hour. Prerequisite: approval by Committee on Student Evaluation and Promotion. Provides students with an overall framework for performance of a history and physical exam and with identification of abnormal physical findings. (Deferred grading only, pending completion of sequence.)

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.

419. Introduction to Clinical Nutrition (3) III. Halsted, Phinney, McCarnish, Rucker and staff

Lecture—5 hours; lecture/discussion—1.5 hours; laboratory/discussion—0.5 hours (over a 4-week period). Prerequisite: approval by Committee on Student Evaluation and Promotion. A 28-hour course that integrates basic and clinical concepts of human nutrition. The course emphasizes nutrient homeostasis and regulation and current perspectives on the role of nutrition in disease. Format is partly lectures, partly discussion/case study. (Same course as Biological Chemistry 419.)

420A. Hematology (4) I. Weilborn

Lecture—4 hours for five weeks; laboratory—6 hours; discussion—2 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Topics include normal hematopoiesis and basic disorders of blood cells, transfusion therapy, immunoglobulin disorders, and hemostasis. Laboratory exercises cover normal and abnormal blood cells and the interpretation of common laboratory tests and are staffed by clinical hematologists.

420B. Gastrointestinal System (3.5) III. Lawson, Zeldis

Lecture/discussion—36 hours (over a 4-week period). Prerequisite: consent by Committee on Student Evaluation and Promotion. Basic pathophysiologic principles of digestive diseases on which clinical concepts and judgements can be developed. Emphasis on pathophysiologic basis of gastrointestinal and hepatic disorders, with case discussions and symposia presented to exemplify basic principles.

420C. Respiratory System (4) II. Lillington

Lecture—38 hours; discussion—10 hours (48 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Lectures, demonstrations

and small group case discussions of respiratory pathophysiology. Includes review of certain clinical aspects of respiratory anatomy, physiology and pathology; introduction to diagnostic procedures; and description of the major respiratory diseases.

420D. Cardiovascular System (3.5) II. Laslett and staff

Lecture—28 hours; discussion—8 hours (36 hours total). Prerequisite: medical student and consent of Committee on Student Evaluation and Promotion; or graduate student and Animal Physiology 113, Human Physiology 200, or the equivalent, and consent of instructor. Introduction to principles of etiology, mechanisms, diagnosis and management of the major diseases of the cardiovascular system, including ischemic, valvular, hypertensive, cardiomyopathic, pericardial, and electrical disorders. Lectures and small group discussions are employed.

420E. Nephrology (2.5) III. Gulyassy

Lecture—18 hours total; discussion—12 hours total; laboratory—2 hours total (32 hours total over a 4-week period). Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamental aspects of (a) disorders of body water, electrolytes and acid/base balance; (b) major categories and mechanisms of parenchymal renal diseases; (c) urinary tract infections.

420F. Metabolic Regulatory System (3.5) III. Soeldner

Lecture—4 hours; discussion—2 hours (over 8-week period). Prerequisite: approval by Committee on Student Evaluation and Promotion. Basic understanding of pathophysiological processes in organs and tissues primarily involved in metabolic regulation and sufficient factual base so that clinical and laboratory findings, diagnosis, and elementary management of patients with endocrinological disorders can be rationalized.

421. Principles of Epidemiology, Occupational Medicine, and Geriatrics (2.5) I. Schenker, Schwab

Lecture—7.5 hours for 4 weeks; discussion—1.5 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamentals of epidemiology and epidemiologic study design, including measures of morbidity, mortality, and risk. Occupational medicine component covers the evaluation of occupational illness, and specific examples of occupational diseases. Geriatrics component covers the comprehensive geriatric assessment, treatment issues, and the long-term care system. (Same course as Community Health 421)

440. Ambulatory Medicine Clerkship (6 or 12) I, II, III, IV. Fitzgerald

Clinical activity—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

Upper Division Course

192. Internship in Cardiology (1-12) I, II, III, IV. Longhurst and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in cardiology. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

220. Basic Science in Cardiology (1) III. Kaufman
Lecture—1 hour. Prerequisite: graduate or medical student status. Fundamentals underlying cardiovascular medicine. Including hemodynamics, neural control of the circulation, biochemistry and some experimental design and statistics. Experts in each of these fields will give current information in their areas. Offered in alternate years. (S/U grading only.)

Professional Courses

401. Clinical Cardiology Clerkship: Kaiser (3-18) I, II, III, IV. The Staff
Clinical activity (4 weeks)—8-12 hours (hospital); 1-5 hours (clinics). Prerequisite: third- and fourth-year medical students with advance approval by Division of Cardiology. Emphasis placed on history taking and physical examination of pediatric and adult patients with congenital and acquired cardiovascular disease. Hospital rounds in CCU and elsewhere. The roles of ECG, PCG, and cardiac fluoroscopy, etc., in office cardiology will be evaluated. May be repeated for credit. Limited enrollment.

460. Cardiology Clinical Clerkship: Consult Service (3-18) I, II, III, IV. The Staff
Clinical activity (inpatient-outpatient service)—full time (40 hours for 4 weeks). 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
Clinical activity (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 mod-

ern 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.

464. Preventive Cardiology (6) I, II, III, IV. Amsterdam
Seminar—2 hours (4 weeks); clinical activity—full time (4 weeks). Prerequisite: completion of third year of medical school. Clinical experience, weekly seminar and reading on primary and secondary prevention of cardiovascular disease. Will be carried out in Lipid and Hypertension Clinics, Exercise Laboratory, Cardiac Care Unit, Cardiac Catheterization, and Cardiac Surgery services.

480. Insights in Cardiology (1-3) I, II, III, IV. The Staff
Clinical activity—3-9 hours. Prerequisite: medical student in good academic standing and approval by Division of Cardiology. Students attend one or more cardiovascular medicine clinics: general, hypertension, arrhythmia. Introduction to the diagnosis/treatment of common cardiovascular problems. (S/U grading only.)

498. Special Group Study: EKG Unit (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Special study—2-week sessions. Prerequisite: medical students with advance approval by monthly attending faculty. Special group study in cardiology for medical students in EKG unit. May include lectures, directed reading, and/or discussion groups. May be repeated for credit. (S/U grading only.) Limited enrollment.

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: approval by Division of Cardiology. (S/U grading only.)

Internal Medicine—Clinical Nutrition and Metabolism

Upper Division Course

192. Internship in Clinical Nutrition (1-12) I, II, III, IV. Halsted, Phinney, and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in nutrition. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

290C. Clinical Nutrition Research Conference (1) I, II, III. Halsted, Phinney, Meredith, Davis
Seminar—1 hour. Weekly seminar presented by a graduate student, taking the form of research completed or in progress, topic review or journal review from current journal. (S/U grading only.)

Professional Courses

461. Nutrition Clinical Clerkship (3-18) I, II, III, IV. Halsted, Phinney, and staff
Lecture—2 hours; clinical activity—full time (2 to 12 weeks). In-depth experience in assessment and monitoring of nutritional support of adult patients at UCD Medical Center whose illnesses are complicated by malnutrition, and of patients attending the Nutrition Clinic with problems in under-nutrition due to various illnesses.

480. Insights in Clinical Nutrition (1-3) I, II, III, IV. Halsted, Phinney, and staff
Clinical activity—3-9 hours. Prerequisite: student in good standing; consent of instructor. Student will attend weekly clinical nutrition consult rounds (four evenings) and/or Nutrition Clinic (one day). Introduction to diagnosis and treatment of common nutritional problems. (S/U grading only.)

499. Research in Nutrition (9-18) I, II, III, IV. Halsted, Meredith, Phinney, Davis
Prerequisite: medical student in good standing; consent of instructor. Participation in on-going clinical or basic nutrition research. Student may devise own project depending upon time commitments.

Internal Medicine—Emergency Medicine

Upper Division Course

192. Internship in Emergency Medicine (1-12) I, II, III, IV. Derlet and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in emergency medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

460. Emergency Medicine Clerkship (3-6) I, II, III, IV. Derlet and staff
Clinical activity—full time (2 to 4 weeks). Prerequisite: third or fourth year medical student; satisfactory completion of Internal Medicine or Surgery clerkship; consent of instructor. Clinical work at UCD Medical Center or other area hospitals' emergency departments will be supplemented by didactic sessions. Students will be assigned appropriate emergency patients and will examine diseases and treat those patients.

465. Acting Internship in Emergency Medicine (6-12) I, II, III, IV. Derlet
Clinical activity—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 and Metabolism

Upper Division Course

192. Internship in Endocrinology (1-12) I, II, III, IV. Walter and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in endocrinology. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, IV. The Staff (Walter in charge)
Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.)

Professional Courses

460. Endocrinology Clinical Clerkship (5-18) I, II, III, IV. Walter and staff
Clinical activity (inpatient-outpatient service)—full time (3 days per unit). Prerequisite: Medical Sciences 431 and/or consent of instructor. Participation with members of subspecialty service in the initial evaluation, work-up, management and follow-up of patients with endocrinologic disorders. Both inpatient and outpatient experience. Limited enrollment.

465. Endocrinology Clinical Clerkship (9 or 18) I, II, III, IV. North
Lecture/discussion/seminar; clinical consultation—20-25 hours. Prerequisite: fourth-year medical students with consent of instructor. Clinical consultations in endocrinology at Martinez VA Hospital under

supervision of medical resident and attending physician. Participation in seminars and conferences.

480. Insights in Endocrinology (1-3) I, II, III, IV.

Walter

Clinical activity—3-9 hours; oral presentation. Prerequisite: student in good academic standing and consent of instructor. First- or second-year students observe in morning Endocrine and Diabetes clinics and attend bi-weekly noon and afternoon endocrine conferences. They also give brief endocrine physiology oral presentation to the endocrine group. (S/U grading only).

499. Research (1-12) I, II, III, IV. The Staff (Walter in charge)

Prerequisite: consent of instructor.

Internal Medicine—Gastroenterology

Upper Division Course

192. Internship in Gastroenterology (1-12) I, II, III, IV. Trudeau and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in gastroenterology. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

290. Frontiers in Basic Gastrointestinal and Liver Research (1.5) I, II, III, IV. Triadafilopoulos

Discussion—1 hour a week; seminar—2 hours a month. Prerequisite: students must be first or second year medical students, graduate students, postgraduate fellows, or resident trainees. Continuing education in basic science areas (biochemistry, molecular biology, physiology, pharmacology) and their applications to clinical gastroenterology and hepatology. Current literature review describing major advances in basic science areas stressing their importance and applications to medical diagnosis and treatment. (Held at VA Martinez Medical Center.) (S/U grading only.)

Professional Courses

460. Clinical Clerkship (3-18) I, II, III, IV. Pimstone and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: completion of third-year of medical school. Work-up, manage, and follow-up new patients on active inpatient consulting service. Gastroenterology/Hepatology patients. Daily rounds with attending physician.

462. Gastroenterology Clinical Clerkship (1-18) I, II, III, IV.

Clinical activity (inpatient-outpatient service). 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 VA Hospital, Martinez.

480. Insights in Gastroenterology (1-3) I, II, III, IV. Trudeau

Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. To gain insight in clinical activities of Gastroenterology Division through attendance at any of the following: endoscopic procedures, ward rounds, outpatient clinic, and G.I. grand rounds. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Pimstone, Trudeau, Zeldis, Prindiville

Clinical activity: varied. Prerequisite: medical student status; consent of instructor. Part-time participation in active clinical and basic research projects. Some will involve both patient care and relevant laboratory procedures. Basic research includes liver metabolism, cancer markers, porphyrias diet and cancer, folate metabolism. (S/U grading only.)

Internal Medicine—General Medicine

Upper Division Course

192. Internship in General Medicine (1-12) I, II, III, IV. J. Robbins and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in general medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

440. Introduction to AIDS and Related Disorders (2) I, II, III, IV. Flynn

Clinical activity—30 hours; discussion—10 hours. Prerequisite: first and second year medical students in good academic standing and permission of instructor. This course familiarizes students with the diagnosis and treatment of individuals infected with the human immunodeficiency virus. Students will interview patients, observe patient care and participate in ongoing clinic research as well as examine alternative life styles. May be repeated for credit. (S/U grading only.)

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 alternate years.

460. General Medicine Consults (1-18) I, II, III, IV. The Staff (Division Chief in charge)

Clinical activity (inpatient-outpatient service)—40 hours. Prerequisite: fourth-year medical students with consent of instructor; a general medicine clerkship. Supervised opportunity to see entire spectrum of medical problems encountered by a general internist. Student spends time in General Medicine Clinic and on the General Medicine Consult Service. Consultation Service is particularly concerned with medical evaluation of surgical patients. Limited enrollment.

471. Clinic of AIDS and Related Disorders (2) I, II, III, IV. Flynn

Clinical activity—30 hours; discussion—10 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. May be repeated for credit. (S/U grading only.)

499. General Medicine Research (1-18) I, II, III, IV. The Staff

Discussion—3 hours; clinical research—8-40 hours. Prerequisite: consent of instructor. The student will be involved in a clinical research problem within the areas, interest and expertise of members of Division of General Internal Medicine. Alternatively, the research effort will be directed toward investigation of a clinical problem of general medical interest.

Internal Medicine—Hematology-Oncology

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

Clinical activity (inpatient-outpatient service)—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 (6-12) I, II, III, IV. Lewis and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: fourth-year medical student in good academic standing. Outpatient rotations include general hematology/oncology clinics, hemophilia clinic, sickle cell clinic, and two medical/surgical joint clinics. In addition, students will work on inpatient hematology and oncology consult service, the bone marrow service, and will attend all conferences sponsored by the Division.

462. Hematology-Oncology Clinical Clerkship (6-18) I, II, III, IV. Gandara, Lawrence and staff

Clinical activity (inpatient-outpatient service)—40 hours. Prerequisite: Medical Sciences 431 and/or consent of instructor. Intensive clinical experience in hematology-oncology at Martinez VA Hospital, with emphasis on evaluating new patients, reading bone marrows, and administering chemotherapy. Weekly tutorial sessions with faculty and presentation of a comprehensive review of one topic. May be repeated for credit. Limited enrollment.

490. Practicum in Care for the Terminally Ill (6) I, II, III, IV. 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 Courses

192. Research Internship in Internal Medicine (1-12) I, II, III, IV. Goldstein and staff

Internship—3-36 hours; final report. Supervised work experience in the division of Infectious Diseases. Undergraduates will have an opportunity to acquire research experience in clinical settings. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Infectious Diseases Research (1-5) I, II, III, IV. The Staff (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 Courses

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 microcomputer applications in medical research.

299. Research in Infectious Diseases (1-12) I, II, III, IV. The Staff (Goldstein in charge)

Prerequisite: consent of instructor. Laboratory investi-

gation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

400. Infectious Diseases Clinic (4.5-6) I, II, III, IV. Goldstein and staff

Clinical activity—full time (3 to 4 weeks). 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.

460. Infectious Diseases Clinical Clerkship (6-18) I, II, III, IV. Goldstein

Clinical activity—full time (4-12 weeks). Prerequisite: successful completion of two years of study in an accredited medical school. In addition to seeing patients ill with infectious diseases regarding whom consultation has been requested, students will have laboratory experience in clinical microbiology. Students will also attend and participate in infectious diseases conferences and rounds. Limited enrollment with priority to third-year medical students.

465. Clinical Clerkship (3-18) I, II, III, IV. McCabe
Lecture—1 hour, discussion—10 hours, laboratory—variable; clinical activity—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 activity—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 (approved for graduate credit), and/or consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results to be reviewed at intervals with instructor and via seminar presentation. (S/U grading only.)

Internal Medicine—Nephrology

Upper Division Course

192. Internship in Nephrology (1-12) I, II, III, IV.

Gulyassy and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in nephrology. May be repeated for credit up to 12 units. (P/NP grading only.)

Professional Courses

460. Nephrology and Fluid Balance (6-12) I, II, III, IV. 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 Electrocytes (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. Independent laboratory research on a specific problem related to biochemical or immunologic causes of renal disease and/or uremic disorders in humans or animals. (S/U grading only.)

Internal Medicine—Occupational and Environmental Health

Upper Division Courses

190C. Research Conference in Occupational and Environmental Health (1) I. Beaumont; II. Samuels; III. McCurdy; IV. Gold

Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in occupational and environmental health. Critical discussion of recent journal articles. May be repeated for credit. (P/NP grading only.)

192. Internship in Occupational and Environmental Health (1-12) I, II, III, IV. Schenker and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in occupational and environmental health. May be repeated for credit up to 12 units. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

250. Pesticide Epidemiology (3) I, III. 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. Environmental Epidemiology (3) II. Gold
Discussion—1 hour; seminar—2 hours. Prerequisite: Epidemiology and Preventive Medicine 405 (may be taken concurrently); upper division undergraduates who have completed Environmental Studies 126; or the equivalent. Examination of the human health effects and the risk of disease from community (and occupational) exposure to toxic waste.

255. Environmental Health Risk Assessment (3) III. Goldsmith, Becker

Seminar—1.5 hours; lecture/discussion—1.5 hours. Prerequisite: course 250 or 251 or consent of instructor. The components of risk assessment include: hazard identification, dose-response, exposure assessment and risk characterization, extrapolation of toxicology, pharmacology, epidemiologic studies, risk management, comparison of cancer and non-cancer endpoints, and risk communication strategies for regulatory policy-making.

Professional Courses

466. Occupational and Environmental Medicine Elective (6-12) I, II, III, IV. Schenker

Clinical and laboratory experience—full time (4 to 8 weeks). Prerequisite: fourth-year student and consent of instructor. Participate in activities of Occupational and Environmental Health Unit. Major activity is involvement in an epidemiologic research project of the University. Also participate in Ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center. (S/U grading only.)

480. Insights in Occupational and Environmental Medicine (1-3) I, II, III, IV. Schenker

Clinical activity—3-9 hours; small research projects. Prerequisite: first- or second-year medical student in good standing; consent of instructor. Students will observe and participate in research and clinical activities in occupational and environmental medicine which include conferences, occupational and environmental medicine clinical activities and field visits. Students develop and present small individual research projects. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Schenker and staff

Laboratory—40 hours; clinical activity—4 or 8 hours. Prerequisite: third- or fourth-year medical student or consent of instructor. Student participates in activities of Division of Occupational and Environmental Health. Major activity is involvement in an epidemiologic research project of the Division. Also participates in ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center.

Internal Medicine—Pulmonary Medicine

Upper Division Course

192. Internship in Pulmonary Medicine (1-12) I, II, III, IV. Albertson and staff

Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in pulmonary medicine. May be repeated for credit up to 12 units. (P/NP grading only.)

Graduate Course

210. Grant and Scientific Paper Writing (1) I, II, III, IV. Last

Discussion—2 hours. Basics of scientific writing for grants and papers. Each student will prepare a grant or paper for critique and tutorial feedback.

Professional Courses

460. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Albertson and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: Medical Sciences 431. At UCD Medical Center participating and rounding with Pulmonary fellows and consultation staff. Also includes pulmonary function test interpretation, outpatient assignments in outpatient clinic and preparation and presentation of material at weekly conferences.

462. Pulmonary Clinical Clerkship (3-18) 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.

480. Pulmonary-Critical Care Medicine Insights (1-3) I, II, III, IV. Albertson

Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Student will attend respiratory outpatient clinics and in-patient pulmonary consultation rounds and medical intensive care rounds. Introduction to diagnosis and treatment of common pulmonary problems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Cross in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Rheumatology-Allergy

Lower Division Course

99. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin

Laboratory—1-4 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Upper Division Courses

- 192. Internship in Rheumatology-Allergy (1-12) I, II, III, IV.** Gershwin and staff
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project by preceptor prior to internship. Supervised work experience in rheumatology-allergy. May be repeated for credit up to 12 units. (P/NP grading only.)
- 199. Directed Research in Immunology (1-5) I, II, III, IV.** Gershwin
Laboratory—1-5 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Graduate Courses

- 281. Clinical Immunology and Immunopathology (4) III.** Gershwin, Robbins
Lecture—4 hours. Prerequisite: Medical Microbiology 107 or Veterinary Microbiology 270, or consent of instructor. Descriptive analysis of animal and human pathologic processes that interact with the immune system. Emphasis on infections, genetics, transplantation, allergy and autoimmunity. Offered in alternate years.
- 298. Topics in Rheumatology and Clinical Immunology (1-5) I, II, III, IV.** Gershwin
Laboratory—1-5 hours. Prerequisite: consent of instructor. Library and/or laboratory work as required. (S/U grading only.)
- 299. Research in Autoimmune Disease (1-12) I, II, III, IV.** Gershwin
Laboratory—1-12 hours. Prerequisite: consent of instructor. Independent research will be encouraged in both animal models of human disease (including congenitally athymic [nude], asplenic, and New Zealand mice) and the cellular immune system of patients with systemic lupus erythematosus, Sjögren's syndrome, polymyositis and drug hypersensitivity. (S/U grading only.)

Professional Courses

- 460. Rheumatology Clinical Clerkship (1-18) I, II, III, IV.** Leek and staff
Clinical activity (inpatient-outpatient service)—full time. Prerequisite: Medical Sciences 431 and consent of instructor. Participation with members of the subspecialty service in the diagnosis and therapeutic management of patients with rheumatologic diseases.
- 461. Allergy Clinical Clerkship (3-18) I, II, III, IV.** Gershwin and staff
Clinical activity (inpatient-outpatient service)—full time (2 to 12 weeks). Prerequisite: completion of second year of medical school and consent of instructor. Student will work with practicing allergist in daily work with patients and participate in weekly allergy clinic and teaching conferences. Study of the literature. Will see patients with problems in clinical immunology, immunodeficiency, asthma, allergic rhinitis.
- 480. Insights in Rheumatology (1-3) I, II, III, IV.** Leek
Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Participation in rheumatology consultation rounds, rheumatic disease clinics and conferences with supervised readings in rheumatology. (S/U grading only.)
- 499. Research (1-12) I, II, III, IV.** The Staff (Gershwin in charge)
Prerequisite: medical student with consent of instructor. Part-time participation in active clinical and basic research projects which can involve both patient care and relevant laboratory procedures. Students can gain experience in clinical medicine and clinical investigation. (S/U grading only.)

Medical Microbiology**Upper Division Courses**

- 107. Chemical and Cellular Immunology (4) II.** Sci-bi-nski
Lecture—4 hours. Prerequisite: Biochemistry 101A, 101B or consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of

antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (Same course as 407.)

115. Ecological Parasitology (2) II. Theis
Lecture—2 hours. Course will be devoted to the study of mankind's influence on environmental factors that affect the development and spread of parasitic agents.

116. Parasitology for Wildlife Biologists (2) III. Theis
Lecture—2 hours. Prerequisite: upper division standing in wildlife biology or biological sciences or ecology. Emphasis on the role diseases and parasites play in wildlife dynamics. Lectures on techniques of collection, preservation and methods of surveying wildlife for parasites and the pathogenesis, ecology and zoonotic potential of parasites encountered by wildlife biologists.

***130. Medical Mycology (2) II.** Pappagianis
Lecture—2 hours. Prerequisite: a course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. Offered in even numbered years. (Same course as 430.)

192. Internship in Medical Microbiology (1-12) I, II, III, IV. The Staff (Beaman in charge)
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in medical microbiology and related fields. (P/NP grading only.)

198. Group Study in Medical Microbiology (1-5) I, II, III, IV. The Staff (Beaman in charge)
Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

199. Research in Medical Microbiology (1-5) I, II, III, IV. The Staff (Beaman in charge)
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. Sci-bi-nski
Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (S/U grading only.) (Same course as 409.)

***215. Medical Parasitology (5) I.** Theis
Lecture—3 hours; laboratory—6 hours. Prerequisite: graduate students with consent of instructor. Epidemiological, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in alternate years. (Same course as 415.)

220. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; student presentations; term paper. Prerequisite: Microbiology 105 or consent of instructor. Critical evaluation of current literature dealing with all aspects of bacterial ultrastructure. Discussion of selected and assigned reading and formal student presentations of assigned topics.

298. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: consent of instructor; open to graduate students. Directed reading and discussion and/or laboratory investigation on selected topics. (Sections 1, 2, 4, 5: S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Beaman in charge)
Prerequisite: consent of instructor; open to graduate students. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

407. Chemical and Cellular Immunology (4) II. Sci-bi-nski
Lecture—4 hours. Prerequisite: medical student with

consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (S/U grading only.) (Same course as 107.)

409. Frontiers in Immunology (2) I, II, III.
Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (Same course as 209.)

***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. Approved for graduate degree credit. Epidemiological, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in alternate years. (S/U grading only.) (Same course as 215.)

420. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; formal presentation or term paper. Prerequisite: medical students with consent of instructor. Evaluation of current status of bacterial ultrastructure with an emphasis on host-parasite interactions through discussions and assigned readings. (S/U grading only.)

***430. Medical Mycology (2) II.** Pappagianis
Lecture—2 hours. Prerequisite: a course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. Offered in alternate years. (Same course as 130.)

480A. Medical Immunology (2.5) III. Benjamins
Lecture—7 hours (four weeks only). Prerequisite: approval by Committee on Student Evaluation and Promotion. Presents the structure and function of the molecules, cells, and tissues involved in immunity, and their interactions in health and disease.

480B. Pathogenic Microbiology (6.5) I. Beaman
Lecture—7 hours for 9 weeks; laboratory—20 hours per quarter. Prerequisite: approval by Committee on Student Evaluation and Promotion. The biology of pathogenic microorganisms with emphasis on their role in human disease.

497T. Tutoring in Medical Microbiology (1-5) I, II, III, IV. Beaman and staff
Tutoring—3-15 hours. Prerequisite: appropriate preparation in subject matter and consent of instructor. Assist instructor by tutoring medical students in one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: medical students with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

Medical Pharmacology and Toxicology**Lower Division Courses**

92. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Internship—3-36 hours; final report. Prerequisite: lower division student with good academic standing; approval of project prior to period of internship.

Supervised work experience in pharmacology and related fields. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Courses

100. 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.

192. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Internship—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in pharmacology and related fields. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Advanced General Pharmacology (3) I. Hance and staff
Lecture—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113) or the equivalent. May be taken concurrently. Core course in human pharmacology designed for graduate and medical students. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs.

***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 (may be taken concurrently). 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 designed for graduate and medical students. Principles in 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 alternate 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 alternate 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 alternate 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 alternate years.

206. Pharmacokinetics (2) I. Henderson
Lecture—2 hours. Prerequisite: courses 200A, 200B. Physicochemical and physiological factors affecting absorption, distribution, metabolism and excretion of drugs. Mathematical and graphical methods for determining pharmacokinetic parameters. Calculation of dose regimens. Offered in alternate years.

206L. Pharmacokinetics Laboratory (2) I. Henderson
Laboratory—6 hours. Prerequisite: course 206 (may be taken concurrently). Laboratory procedures for determining pharmacokinetic values in experimental animals. Exercises designed to follow subject matter sequence of course 206. Offered in alternate years.

208. Application of Computers to Pharmacology (1) I, II, III. The Staff
Lecture—1 hour. Prerequisite: consent of instructor. Presentation of basic concepts and problems.

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 (2.5) I. Hance and staff
Lecture—6 hours for 4 weeks; discussion—2 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Principles in pharmacology, including pharmacokinetics, drug metabolism and the actions, uses and toxicities of the major classes of drugs.

400B. Principles of Pharmacology (6) II. Winters and staff
Lecture—4 hours; discussion—2 hours. Prerequisite: consent of Committee on Student Evaluation and Promotion. Principles in pharmacology including pharmacokinetics, drug metabolism and the actions, uses and toxicities of the major classes of drugs.

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.)

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

201. Human Behavioral Neurobiology (2) I. Jagust, Robertson
Lecture/discussion—2 hours. Prerequisite: Cell Biology and Human Anatomy 203; Psychology 108 or 136. Neurobiology of normal and abnormal behavior of humans, based on specific neuroanatomical, neurophysiological, and cognitive parameters. Evaluation of these parameters will be, for example, by application of clinical neurologic, neuropsychologic, and neuroimaging tests.

202. Visuomotor Neurobiology (2) III. Rafal
Seminar—2 hours. Prerequisite: Human Anatomy 203; course 201. An overview of neural mechanisms of visually guided behavior in humans will examine the integration of visual attention and eye movements. Performance of normal humans and neurologic patients in reflexive orienting, visual search, reading and reaching will be considered. Offered in alternate years.

290. Seminar in Selected Topics (1) I, II, III, IV. 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. Remler and staff
Lecture—6 hours; laboratory/discussion—5 hours (for four weeks total). Prerequisite: medical student with consent by Committee on Student Evaluation and Promotion. Lectures and case discussions of pathophysiology underlying neurological disorders including disorders of development, muscle, nerve, cerebral circulation, metabolism, myelin, cortical function, movement, cerebro-spinal fluid, autonomic function and special senses. Anatomical basis of clinical testing, nervous system infection, neoplasia and trauma will be discussed.

450. Clinical Neurology Clerkship (6) I, II, III, IV. Seyal 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. Gospe
Clinical activity—full time (4 weeks). Prerequisite: satisfactory completion of Medical Sciences 431, 432A, and 432B and consent of instructor. Student exposed to children with disorders of the nervous system, both in outpatient and inpatient services. Cases presented to a member of full time faculty who will discuss clinical findings, differential diagnosis, management and therapy. This course satisfies the fourth year neuroscience requirement.
- 456. Cortical Neurology (3-18)** I, II, III, IV. Remler, Knight
Clinical neurological research—full time (12 weeks at Martinez VA Hospital). Prerequisite: course 451 or the equivalent; consent of instructor. Student will pursue a small project in clinical neurologic research on higher cortical functions. The focus is on scientific analysis of behavior in disease states. Study may be arranged for from two weeks to twelve weeks, with units corresponding to length of course.
- 457. Special Topics in Neurology (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. Indepen-

dent 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

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 activity—3 to 9 hours. Prerequisite: student in good academic standing; consent of instructor. Attendance at neurology grand rounds and regular rounds following. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Gabor in charge)

Laboratory—2-24 hours. Prerequisite: consent of instructor. Approved for graduate degree credit. Laboratory investigation on selected topics. (S/U grading only for graduate 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. Approved for graduate degree credit. Admission and follow-up of patients. Neurological history, examination and further diagnostic procedures emphasized. Students participate in meaningful aspects of surgical procedures and attend listed conferences, rounds, and seminars.

464. Externship (6-18) I, II, III, IV. The Staff (Chairperson in charge)

Clinical activity—full time (4-12 weeks). Prerequisite: fourth-year medical student having completed a neurosurgical clerkship or consent of instructor.

Clerkship in neurosurgery to be arranged at another institution with accredited residency program in neurosurgery under proper supervision.

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 activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Observation of neurosurgical care in emergency room, operating room and hospital floors, including manner of treatment of a variety of chronic and acute neurological diseases. (S/U grading only.)

499. Neurosurgery Research (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

***420. Reproductive System/Perinatology (2)** IV. OI
Lecture—3.5 hours. Introduction to clinical obstetrics and gynecology and perinatology as an extension of material introduced in the sciences basic to medicine in anatomy, reproductive physiology, and

molecular biology/genetics. (Same course as Pediatrics 420.)

465. Elective Clerkship (4-18) I, II, III, IV. The Staff
Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical student; Medical Sciences 432A (or the equivalent); consent of instructor. Active participation in inpatient and outpatient care. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

470. Acting Internship in Obstetrics and Gynecology (6-8) I, II, III, IV. OI
Clinical activity—full time (4-6 weeks). Prerequisite: third- and fourth-year medical students who have completed Medical Sciences 432A; consent of instructor. Student will perform as intern and expect the following experience: Obstetrics and Gynecology, 2 weeks each; perform inpatient care; be on call every third night; attend scheduled conferences one half-day per week. Round daily with attending.

471. Ambulatory Gynecology and Obstetrics (6-8) I, II, III, IV. 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
Internship—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in ophthalmology research. Research staff in Ophthalmology have programs in cell biology, electron microscopy, biochemistry, immunology and visual psychophysics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Course

299. Basic Research in Visual Science (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

440. Ophthalmology Required Clerkship (3) I, II, III, IV. J. Brandt
Clinical activity—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Fundamental knowledge of ophthalmic diagnosis and principles; basic ophthalmic instruments; understanding of treatment for eye problems manageable by a primary care physician; knowledge of what patients should be referred for ophthalmic care.

461. Basic Clinical Ophthalmology (4.5) I, II, III, IV. J. Brandt
Clinical activity—to be arranged (3 weeks). Prerequisite: medical students who have completed either Medical Sciences 430 or course 440 (in third or fourth year); consent of instructor. Provides an acquaintance with the fundamentals of routine clinical ophthalmology.

465. Advanced Subspecialty Ophthalmology (6 or 9) I, II, III, IV. Mannis, Keltner, J. Brandt
Clinical activity—to be arranged (4 weeks off campus

or 6 weeks at UCD Medical Center). Prerequisite: medical students who have completed either Medical Sciences 430 or course 440 (in third or fourth year); consent of instructor. Participation in disciplines of neuro-ophthalmology/pediatric ophthalmology, diseases of the cornea and external eye, glaucoma and retina. Rotations at UCD Medical Center may be arranged in 6-week units of one service alone, or in combination, as arranged with instructors.

480. Insights in Ophthalmology (1-3) I, II, III, IV. J. Brandt and staff
Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical exposure in ophthalmology including slide-tape program, patient exposure, and department conferences (i.e., grand rounds and subspecialty conference). (S/U grading only.)

498. Group Study (1-3) I, II, III, IV. The Staff (J. Brandt in charge)
Prerequisite: medical students with consent of instructor. Directed reading and discussion. (S/U grading only.)

499. Research in Ophthalmology (1-12) I, II, III, IV. The Staff
To be arranged—3-36 hours. Prerequisite: medical students with consent of instructor. Individual research on selected topics in optics and visual physiology, cornea and external disease. (S/U grading only.)

Orthopaedic Surgery

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. The Musculoskeletal System (2.5)**
Lecture—5 hours for 5 weeks; laboratory-discussion—1 hour. Prerequisite: approval by Committee on Student Evaluation and Promotion. An introduction to the basic and clinical science of orthopaedic surgery and rheumatology.

426. Initial Management of Musculoskeletal Trauma (3-6) I, II, III, IV. Rodrigo
Clinical activity—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. Rodrigo
Clinical activity—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. Rodrigo

Clinical activity—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. Rodrigo

Clinical activity—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing and consent of instructor. Designed to acquaint student with private practice of orthopaedics in the community setting. Opportunity to observe and assist private practitioners in office, emergency room and inpatient environment. Preceptorships available in Sacramento and surrounding areas. Student must provide own transportation.

464. Acting Internship (6) I, II, III, IV. Rodrigo
Clinical activity—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing; and consent of instructor. Rotation designed to increase basic knowledge of musculoskeletal abnormalities at clinical level. Attention focused on selective case material. For those students who demonstrate proficiency, responsibility will be similar to that of intern. Does not meet surgical specialty requirement.

480. Insights in Orthopaedic Surgery (1-3) I, II, III, IV. Szabo

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to aims, methods and procedures in orthopaedic surgery via attendance at grand rounds, patient care conferences, and group discussions. (S/U grading only.)

499. Orthopaedics Research (1-12) I, II, III, IV. The Staff (Rodrigo in charge)
Clinical activity—3 hours to full time (to be arranged with individual faculty). Prerequisite: third- or fourth-year student in good academic standing; consent of instructor. Laboratory or clinical investigation on selected topics. (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
Internship—3 to 36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in otolaryngology and related fields. Final project report. (P/NP grading only.)

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

199. Special Study in Otolaryngology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: advanced undergraduate with consent of instructor. (P/NP grading only.)

Graduate Courses

290C. Research Conference in Otolaryngology (1) I, II. The Staff
Lecture/discussion—1 hour. Prerequisite: graduate students; medical students; advanced undergraduates with consent of instructor. Presentation and discussion of faculty and student research in otolaryngology. (S/U grading only.)

291. Principles of Speech, Hearing and Equilibrium (3) II. The Staff
Lecture/discussion—3 hours. Prerequisite: graduate students; medical students; advanced undergraduates with consent of instructor. Presentations by faculty and guest lecturers on anatomy, physiology, and

behaviors involved in speech production, hearing, and equilibrium. Each student will be expected to make one class presentation.

298. Group Study (1-5) I, II, III, IV. The Staff (S/U grading.)

299. Individual Study in Otolaryngology for Advanced Graduate Students (1-12) I, II, III, IV. Chole and staff

Prerequisite: advanced graduate student with consent of instructor. (S/U grading only.)

Professional Courses

401. Clinical Examinations in Otolaryngology (1) I, II, III, IV. Chole

Lecture—1 hour; laboratory—1 hour; practical—1 hour total. Prerequisite: second-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required.

402. Otolaryngology in Family Practice (1) I, II, III, IV. Lecture—10 hours total. Prerequisite: fourth-year medical students and family practitioners with consent of instructor; open to graduate students. Approved for graduate degree credit. Planned as a refresher course for those already possessing a background of knowledge in the specialty.

403. Basic Principles of Reconstructive Surgery (1) II. Donald

Lecture—four 2-hour sessions; laboratory—one 2-hour session (5 weeks). Prerequisite: third- or fourth-year medical student with consent of instructor. Formal presentations covering basic principles of reconstructive surgery, including wound healing, treatment of lacerations, skin and bone grafts, flaps, Z-plasties and revision of scars. Laboratory devoted to utilizing animal tissues.

440. Otolaryngology Required Clerkship (3) I, II, III, IV.

Clinical activity—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Provides fundamental knowledge of otolaryngologic diagnosis and principles, develops facility with basic Ear, Nose and Throat instruments, provides an understanding of treatment for ear, nose and throat problems manageable by a primary care physician, provides knowledge of what patients should be referred for otolaryngologic care.

460. Clinical Otolaryngology Elective (3-18) I, II, III, IV.

Clinical activity—full time. Prerequisite: third- and fourth-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Total involvement in clinical activities of the department.

480. Insights in Otolaryngology (1-3) I, II, III, IV. Senders

Clinical activity—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Individualized activities (depending upon time available and previous exposure to Ear, Nose and Throat) including observing patient exams, ward rounds and attendance at lectures and grand rounds. (S/U grading only.)

***490. Journal Seminar (1) I, II, III, IV.** Donald, Chole
Lecture/discussion—10 hours total (course given three times per quarter). Prerequisite: fourth-year medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Monthly review of current otolaryngologic and related literature and recent advances.

498. Individual or Group Study (1-5) I, II, III, IV. The Staff

Lecture/discussion—1-2 hours; laboratory—1-4 hours. Prerequisite: consent of instructor. Introduction to basic research in Otolaryngology. Lectures, discussion and laboratory study of sensory and motor systems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff

Prerequisite: medical students with consent of instructor; open to graduate students. Approved for graduate degree credit. Participation in ongoing projects.

Pathology

Upper Division Courses

192. Internship in Human Pathology (1-12) I, II, III, IV. The Staff

Internship—3-36 hours; final project report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in pathology and related fields. (P/NP grading only.)

199. Special Study in Pathology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced 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. Discussion of current topics in tumor biology by invited speakers and members of the class. A forum for presentation of proposed and completed experiments by persons interested in tumor biology.

207. Introduction to Nervous System Pathology (1-4) I, II, III, IV. Ellis

Seminar—1-4 hours. Prerequisite: consent of instructor; open to advanced undergraduate, graduate, veterinary medical, and medical students. Study of nervous system tissue responses to injury, infection, neoplasia, and malformation in both the human and experimental animal. Seminars include correlation of clinical, gross and microscopic findings. Discussions provide introduction 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

***405. Brain-Cutting Conference (1-4) I, II, III, IV.** Ellis
Prerequisite: third- and fourth-year medical students or consent of instructor. Current specimens are sectioned, discussed, and clinical correlations proposed.

***407. Diseases of the Nervous System (1-3) I, II, III, IV.** Ellis

Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: third- and fourth-year medical students or special training in pathology or neurological sciences; consent of instructor. Study of human nervous system reactions to disease including infection, neoplasia and maldevelopment; application of experimental models to human disease; and clinical correlations. Seminars emphasize microscopic findings in current cases; discussions include individualized experience in neuropathologic techniques. Given jointly with the Departments of Neurology and Neurosurgery.

***408. Anatomic Pathology Case Studies (1-12) I, II, III, IV.** Ruebner

Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical student or consent of instructor. Participation and/or performance, under supervision, of complete autopsies and surgical pathology, with correlative discussion of clinical material, gross, microscopic and laboratory findings.

411. Pathology I (5) III. Ruebner

Lecture—4 hours; laboratory—7 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Lectures and computer-assisted learning. Introduces basic human disease processes. Mastery

of pathophysiology and vocabulary is stressed. Methods of examining gross and microscopic tissue sections are taught.

412. Systemic Pathology (7.5) IV. Cardiff

Lecture—6 hours (for 6 weeks); laboratory—12 hours; laboratory-discussion—6 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Provides in-depth study of disease and mechanisms of disease as they relate to specific human organ systems. Basic concepts of pathophysiology are introduced which have application in clinical settings.

464. Anatomical Pathology (6-12) I, II, III, IV. Tesluk
Clinical activity—40 hours (for 4-8 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. Students attend surgical pathology conferences and seminar sessions in which clinical correlation and diagnostic information is discussed.

465. Applied Clinical Laboratory Medicine (9) III. Miller

Clinical activity—full time (6 weeks). Prerequisite: consent of instructor. Use of the clinical laboratory for the diagnosis and management of patients. Includes bench techniques, new instrumentation, quantitative analysis, test interpretation, and research approaches applicable to patient care. (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 precep-

tor performing such tasks as history taking, physical examination, and patient management.

420. Reproductive System/Perinatology (2) IV. OI Lecture—3.5 hours (for 6 weeks). Introduction to clinical obstetrics and gynecology and perinatology as an extension of material introduced in the sciences basic to medicine in anatomy, reproductive physiology, and molecular biology/genetics. (Same course as Obstetrics and Gynecology 420.)

460A. Acting Internship: General Inpatient Pediatric Clerkship (6-18) I, II, III, IV. Halsted Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. The Ward Acting Intern functions in a manner similar to that of a pediatric intern. The Acting Intern takes admissions in the regular sequence and is expected to take night call. The Acting Intern can expect to manage between six and ten patients at a time. Limited enrollment.

460B. Acting Internship: Outpatient Pediatrics (6-18) I, II, III, IV. Reinhart

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Supervised experience in pediatric care on outpatient service at UCD Medical Center. Student functions as "Acting Intern" with appropriate supervision by residents and attending faculty. Limited enrollment.

461. Elective in Pediatric Hematology/Oncology (3-18) I, II, III, IV. Abildgaard

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of hematologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

462. Elective in Pediatric Endocrinology (3-18) I, II, III, IV. Connors and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: completion of second-year study or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of endocrine disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

464. Acting Internship in Neonatology (6-18) I, II, III, IV. Merritt

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Diagnostic and therapeutic aspect of the medical and surgical high-risk neonate. Student expected to take night call. Limited enrollment.

465. Pediatric Specialty Clinic Elective (3-18) I, II, III, IV. Reinhart and staff

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Supervised experience in a variety of pediatric subspecialty clinics. Limited enrollment.

466. Elective in Pediatric Cardiology (3-18) I, II, III, IV. Parrish

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B. Inpatient and outpatient experience in diagnosis and management of cardiologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged.

467. Elective in Pulmonary Medicine (3-18) I, II, III, IV. McDonald, Joad

Clinical activity—full time (2 to 12 weeks); daily rounds, two weekly half-day clinics. Prerequisite: pediatric clerkship. Inpatient and outpatient management of pediatric patients with pulmonary diseases. These will include but will not be limited to cystic fibrosis, asthma, and other forms of chronic pulmonary diseases as well as congenital abnormalities.

468. Elective in Pediatric Nephrology (3-18) I, II, III, IV. Makker

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of renal disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

469. Elective in Pediatric Infectious Disease (3-18) I, II, III, IV. Halsted

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and treatment of infectious disease of infants and children. Laboratory and clinical investigation may be arranged. Limited enrollment.

470. Elective in Pediatric Neurology (3-18) I, II, III, IV. Gospe

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 431, 432A, and 432B and consent of instructor. Inpatient and outpatient experience in diagnosis and management of neurological disorders in children. Students will also participate in other pediatric subspecialty clinics which serve children with neurological disorders. This course does not satisfy the fourth year neurology requirement. Limited enrollment.

471. Elective in Pediatric Gastroenterology (3-18) I, II, III, IV. Cannon, Wenner

Clinical activity—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of gastroenterology disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

476. Acting Internship in Pediatric Intensive Care (6-18) I, II, III, IV. Shelkh

Clinical activity—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of A or consent of instructor of record; letter of recommendation from Pediatrics faculty member. Evaluation and support of critically ill infants and children. In general, student expected to take night call every third night during rotation. Limited enrollment.

***499. Research Topics in Pediatrics (1-18) I, II, III, IV.** The Staff (Styne in charge)

Prerequisite: student in Medical School with consent of instructor. Individual research project in pediatric subspecialty areas (cardiology, endocrinology, hematology, metabolism, newborn physiology and others) may be arranged with faculty member. Independent research by student will be emphasized and long-term projects are possible. (S/U grading only.)

Physical Medicine and Rehabilitation

Upper Division Courses

192. Internship in Physical Medicine and Rehabilitation (1-12) I, II, III, IV. The Staff (Entrikin coordinator) Internship—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work 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 sys-

temic 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 or graduate 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 activity—full time (2 weeks). Prerequisite: Third- or fourth-year medical student; consent by Committee on Student Evaluation and Promotion. Rehabilitation medicine and geriatrics relating to comprehensive care of the physically disabled and the physical medicine management of neurologic and musculoskeletal disorders. Physiological effects, indications and contraindications of the therapeutic modalities and their application to common musculoskeletal disorders.

461. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. The Staff

Clinical activity—full time. Prerequisite: completion of third year in Medical School; Medical Sciences 430, 431. Intended for non-JC 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 activity—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.

461. Dentistry for Future Physicians and Surgeons (6-8) I, II, III, IV. Thaller

Discussion-seminar—3 hours; laboratory—2 hours; clinic activity—full time (4-6 weeks). Prerequisite: third- or fourth-year medical students. General practitioners must recognize dental-related problems, have the ability to alleviate potential pain, and be able to refer these problems for further definitive evaluation and treatment. Students will have basic knowledge of dentistry; recognize potential dental problems; provide emergency care; have knowledge of where to refer these problems. (S/U grading only.)

Psychiatry

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. Moot court demonstrations. (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. Medicine and the Mind: An Introduction to Psychiatry (2) I. Steward

Laboratory/discussion—3 hours. Prerequisite: approval by Committee on Student Evaluation and Promotion. Introduction to concepts and clinical applications of psychiatry throughout the human life cycle. Includes tutorials tailored to individual student interests which will explore the biological, psychological, social, and cultural factors influencing health and illness. Includes lecture and video presentations as well as group discussion.

402. Human Sexuality (1) VI. Blacker

Lecture—2 hours; discussion—2 hours. 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.

403. Psychopathology (3.5) VI. Maddock

Lecture—6 hours; discussion—2 hours (5 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to basic aspects in mental/emotional dysfunction. Focus on understanding the development and symptomatology of major forms of psychiatric dysfunction.

412. Psychiatry Grand Rounds (1) II, III, IV. Grindlinger and staff

Lecture—1 hour. Prerequisite: medical students or

staff or other qualified mental health professionals with consent of instructor. Weekly conference at UCD Medical Center for presentation of selected clinical cases, presentation of lecture and research reports.

413. Outpatient Psychiatry Clerkship (6-12) I, II, III, IV. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) 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. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of instructor. Student functions as member of the team in evaluation, management, and psychiatric liaison with other medical specialties. Intensive supervision from senior staff and psychiatric residents.

415. Psychiatric Emergency Clerkship (6) I, II, III, IV. Grindlinger

Clinical activity—32 hours; lecture-conference—8 hours. Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or 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. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of instructor. Didactic and clinical inpatient, outpatient, and consultation-liaison experiences with children, adolescents and families. Clinical observations, diagnostic assessment, and treatment will be undertaken with close supervision. Literature review and case conferences presented on a regular basis.

417. Jail Psychiatric Clerkship (6 or 12) I, II, III, IV. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of course coordinator. Students gain experience, under close faculty supervision, assessing acute and chronic mentally ill inmates in both inpatient and clinic settings.

418. Off-Campus Clinical Experience (6-12) I, II, III, IV. Grindlinger 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. The Staff Seminar—five 2-hour sessions. Prerequisite: medical student, psychiatric residents, clinical psychology graduate students, or consent of instructor. Approved for graduate degree credit. 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. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of course coordinator. Acting intern position 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: Martínez VA Hospital (6-12) I, II, III, IV. Grindlinger and staff

Clinical activity—full time (4 to 8 weeks). Prerequisite:

Medical Sciences 433 (Psychiatry Core Clerkship) and/or consent of instructor. 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. Grindlinger 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. Grindlinger

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. Approved for graduate degree credit. Medical students desiring to explore particular topics in depth. (S/U grading only for graduate or medical students.)

499. Research (1-12) I, II, III, IV. Grindlinger and staff

Prerequisite: consent of instructor. Approved for graduate degree credit. Individual research on selected topics or research projects. (S/U grading only for graduate or medical students.)

Radiation Oncology

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 in Therapeutic Radiology (1.5-9) I, II, III, IV.

Clinical activity—full time (1-6 weeks). Prerequisite: completion of third year of medical school; 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. Approved for graduate degree credit. (S/U grading only for medical students.)

499. Research in Therapeutic Radiology (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Radiology—Diagnostic

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.

413. Radiological Diagnosis II (Physics of Diagnostic Radiology) (5) I. Seibert, Leidholdt

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. Offered in alternate years. (S/U grading only.)

414. Medical Radiation Biology (3) III. Bushberg, Leibold

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. Offered in even numbered years only. (S/U grading only.)

***415. Radiopharmacy (3) III.** Vera

Lecture—3 hours. Prerequisite: consent of instructor. Fundamentals of radiopharmaceutical science including radiochemistry; radiopharmaceutical production; theory; applications; mechanisms of localization, radionuclide and radiopharmaceutical drug applications and related regulatory aspects. Offered in alternate years. (S/U grading only.)

461. Clinical Clerkship in Diagnostic Radiology (1-18) I, II, III, IV. Rosenquist

Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of Medical School; consent of instructor. Student works with radiologists at UCD Medical Center in film reading sessions and radiological procedures; includes fluoroscopy, vascular radiology and special investigations. Includes daily individual teaching sessions with faculty radiologists, radiology learning laboratory, and all-radiology conferences and seminars. Limited enrollment.

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

499. Research in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Radiology—Nuclear Medicine

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 (Stadnik in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Course

299. Research: Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Director in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

401. Biomedical Radiochemistry (3) III. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: open to graduate and medical students; consent of instructor. Approved for graduate degree credit. Course is designed to combine basic nuclear physics, chemistry, and biology into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (Same

course as 101.)

411. Radiological Physics I (Physics of Nuclear Medicine) (5) I. Bushberg, Leibold, Vera
Lecture—43 hours total; laboratory—12 hours total. Prerequisite: consent of instructor. Physics of diagnostic and therapeutic nuclear medicine, nuclear physics, radioactive decay; interaction of ionizing radiation; dosimeters; attenuation; internal and external dosimetry; health physics; radiation detection and imaging, scintillation cameras, computerized planar and tomographic imaging. Offered at VA Hospital, Martinez. Offered in alternate years. (S/U grading only.)

463. Clinical Clerkship in Nuclear Medicine (9 or 18) I, II, III, IV. Stadnik

Clinical activity—full time (3 days per unit). Prerequisite: satisfactory completion of second year of Medical School or the equivalent; consent of instructor. Clerkship correlates radioisotopic methods with clinical, pathophysiologic, and other diagnostic aspects of the patient's care. Each patient reviewed with student by faculty member. Reading assignments, informal projects, and research techniques available. Limited enrollment with preference to students enrolling for 18 units.

498. Group Study in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Stadnik in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Stadnik in charge)

Prerequisite: consent of instructor. Approved for graduate degree credit. (S/U grading only for medical students.)

Surgery

Upper Division Courses

192. Internship in General Surgery (1-12) I, II, III, IV. The Staff

Internship—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in general surgery and related fields. (P/NP grading only.)

199. Special Study in General Surgery for Advanced Undergraduates (1-5) I, II, III, IV. The Staff
Prerequisite: advanced undergraduate student with consent of instructor. (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, IV. Wolfe in charge
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

419. Introduction to Clinical Surgery (1-6) I, II, III, IV. Ward

Clinical activity—full time. Prerequisite: second-year medical student with consent of instructor. Designed to introduce medical students to basic principles of surgical practice and the most common surgical diseases. Course will afford opportunity to review surgical patients and discuss them with members of staff.

460. Clinical Surgical Elective (3-9) I, II, III, IV. The Staff

Clinical activity—full time (2 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Preparation of patients, treatment, operative care, and postoperative follow-up. Services include Surgery Clinics, Surgical Nutrition, Pediatric Surgery, Cardiothoracic Surgery, Gastrointestinal Surgery, and Burn Clinic.

461. Surgery Burn Unit Clerkship (6 or 9) I, II, III, IV. The Staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student functions as an extern in the eight-bed Burn Unit; learns principles of critical care, fluid and electrolyte resuscitation and management of surgical wounds.

462. Surgery Trauma Service Clerkship (6 or 9) I, II, III, IV. Blaisdell and staff

Clinical activity—full time (4 or 6 weeks). Prerequisite:

fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student works as an extern on one of the two general surgery Trauma teams, participating in resuscitation and management of critically injured patients. Team hours consist of 24 hours on, and 24 hours off.

463. Surgery Intensive Care Unit (6 or 9) I, II, III, IV. Holcroft and staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates in direct supervision of critically ill surgical patients in a twelve-bed surgery ICU. Each student is closely supervised. Provides in-depth experience with management of critically ill patients.

464. General Surgery Clerkship: Kaiser Hospital (6 or 9) I, II, III, IV. The Staff

Clinical activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates with University residents on the teaching services at Kaiser Hospital, Sacramento. Opportunity to see larger number of practical, general surgical problems and participate in their care.

465. General Surgery Clerkship: Martinez VA Hospital (6, 9, or 12) I, II, III, IV. Guernsey, Ward

Clinical activity—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 activity—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Opportunity to participate on the surgical service of our affiliated Air Force Hospital. The program has a large number of general surgery problems and provides a broad clinical experience in surgery.

467. Surgical Oncology (3-9) I, II, III, IV. Goodnight and staff

Clinical activity—full time (2 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Student learns medical and surgical principles applicable to cancer. Participation in the care and major surgical oncologic problems; and opportunity to learn the medical, radiologic, and surgical approaches to cancer therapy.

468. Cardiothoracic Surgery Clerkship (6-9) I, II, III, IV. Benfield

Variable clinical activity—full time (4 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Student works as an extern on the Cardiothoracic Surgical Service, participating in perioperative management and operations on the heart, lungs, mediastinum, and other thoracic structures. Regularly scheduled teaching conferences are conducted.

478. Surgical Preceptorship: Off Campus (6-18) I, II, III, IV. 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 activity—3 to 9 hours. Prerequisite: good academic standing and consent of instructor. Individualized activities, including ward rounds, subspecialty clinics and conferences, grand rounds, and observation of a variety of surgical procedures. (S/U grading only.)

494H. Fourth-Year Surgical Honors Program (18) I, II, III, IV. Wolfman

Prerequisite: completion of third year of Medical School with superior performance on Medical Sciences 430; consent of instructor. To provide intensive and comprehensive training in surgery to students

interested in postgraduate surgical career, that would enable them to succeed during the internship and residency training. (S/U grading only.)

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

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. deVere White

Prerequisite: consent of instructor. (PNP grading only.)

Professional Courses

400. Office Urology (1) I, II, III, IV. deVere White

Clinical activity—4 hours in afternoons (6 weeks). Prerequisite: fourth-year medical students with consent of instructor. Introduction to ambulatory care of urologic patients including basic therapeutic and diagnostic procedures from case material referred to private clinic. Management of urinary tract infection will be emphasized.

460. Urology Clinical Clerkship (5-18) IV, I, II, III. deVere White

Clinical activity—full time. Prerequisite: second-year medical student; physical diagnosis or the equivalent; consent of instructor. Clinical experience in diagnosis and treatment of urologic disease. Student will work closely with house staff, participate in conferences and surgery, and perform initial patient evaluation on new patients. May be repeated for credit. Limited enrollment.

461. Externship in Urology (5-18) I, II, III, IV. deVere White

Clinical activity—full time. Prerequisite: fourth-year medical students with consent of instructor. Under supervision, student acting as intern will assume full inpatient responsibility including admission history, physical examination, management of hospitalization, and participate in surgical procedures, outpatient clinic and learning diagnostic and therapeutic procedures. May be repeated for credit.

465. Surgical Team Participation: Martinez VA

Medical Center (6 or 12) I, II, III, IV. Merrill
Clinical activity—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. deVere White

Research—3-36 hours. Prerequisite: medical or veterinary medical students with consent of instructor. Research in oncology, male infertility, urodynamics, neurogenic bladder. Unique opportunity to apply recent technologies (nuclear medicine resonance, flow cytometry, recombinant DNA) in investigation, diagnosis and treatment of GU cancer, infectious disease, male infertility and development of genitourinary bioprosthesis.

Medicine

(School of Veterinary Medicine)

Anthony A. Stannard, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2102 Medical Science 1A
(916-752-1363)

Faculty

Alexander A. Ardans, D.V.M., M.S., Professor

Jeffrey E. Barlough, D.V.M., Ph.D., Assistant

Research Virologist

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 Emeritus

Jeanne W. George, D.V.M., Ph.D., Assistant

Research Clinical Pathologist

Lisle W. George, D.V.M., Ph.D., Associate Professor

Ronald P. Hedrick, Ph.D., Associate Professor

Roy V. Henrickson, D.V.M., Adjunct Lecturer

David E. Hinton, Ph.D., Professor

Charles A. Hjerpe, D.V.M., Professor

Peter J. Ihrke, V.M.D., Professor

Mark D. Kittleson, D.V.M., M.S., Ph.D., Associate

Professor

Gerald V. Ling, D.V.M., Professor

Donald G. Low, D.V.M., Ph.D., Professor Emeritus

John P. Maas, D.V.M., M.S., Assistant Professor of

Clinical Diagnostic Medicine (*California*

Veterinary Diagnostic Laboratory)

John Madigan, M.S., D.V.M., Assistant Professor

Richard W. Nelson, D.V.M., Assistant Professor

Niels C. Pedersen, D.V.M., Ph.D., Professor

William R. Pritchard, D.V.M., Ph.D., J.D., Professor

Livio G. Raggi, D.V.M., Ph.D., Professor Emeritus

Edward C. Ramsay, D.V.M., Lecturer

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., Research Associate

Sharon J. Spier, D.V.M., Ph.D., 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

Michael Torten, D.V.M., Ph.D., Research Virologist

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., Associate

Professor

William W. Wingfield, M.S., Ph.D., Associate Adjunct

Professor

Janet Yamamoto, Ph.D., Assistant Research

Immunologist

Courses in Medicine

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (PNP 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 (1 1/2 per week) I, II, III. The Staff (Ling in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Resident responsible for diagnoses, medical and surgical treatment of animals in the wards and outpatient clinic, including history taking, physical examinations, laboratory tests, special diagnostic and therapeutic procedures, and consultations, under the direction of the senior staff. May be repeated for credit. (S/U grading only.)

402. Large Animal Medicine (1 1/2 per week) I, II, III. The Staff (Smith in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of patients in the VM Teaching Hospital and outpatient clinics under the direction of the senior staff of the hospital. May be repeated for credit. (S/U grading only.)

403. Small Animal Medicine (1 1/2 per week) I, II, III. The Staff (Ling in charge)

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of animals in the wards and outpatient clinic including physical examinations, history taking, laboratory tests, and consultations under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

404. Herd Health Management (1 1/2 per week) I, II, III. Hjerpe in charge

Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents apply their knowledge of veterinary medicine, animal nutrition, genetics, husbandry, management, and economics on a herd basis toward the improvement of food animal production efficiency through control and prevention of disease. (S/U grading only.)

421. Veterinary Dermatology (3/4 per week) I, II, III. Stannard

Laboratory—25 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents are responsible for patient care in the hospital and outpatient clinic including history taking, physical examinations, and diagnostic procedures under the direction of the staff dermatologist. (S/U grading only.)

*423. Pulmonary Diseases (3/4 per week) I, II, III. 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 (3/4 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 (1/2) I, II, III. The Staff (Ling in charge)

Discussion—1 hour. Prerequisite: professional standing, intern, or resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the small animal clinic. May be repeated for credit. (S/U grading only.)

492. Large Animal Grand Rounds (1/2) I, II, III. The Staff (Carlson in charge)

Discussion—1 hour. Prerequisite: professional standing as resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. May be repeated for credit. (S/U grading only.)

493. Seminar in Veterinary Medicine (1) I, II, III. The Staff (Cowgill and Smith in charge)

Seminar—2 hours. Prerequisite: professional standing; resident in Veterinary Medical Teaching Hospital. Seminars given by the faculty of the School of Veterinary Medicine in topics relating directly to the practice of clinical medicine and surgery. Residents will

assist in the presentation of seminar material. May be repeated for credit. (S/U grading only.)

Medieval Studies

(College of Letters and Science)
_____, Ph.D., Program Director
Program Office, 922 Sproul Hall (916-752-1219)

Committee in Charge

Samuel G. Armistead, Ph.D. (*Spanish*)
Dennis J. Dutschke, Ph.D. (*Italian*)
Ingeborg Henderson, Ph.D. (*German*)
Winder McConnell, Ph.D. (*German*)
James J. Murphy, (*Rhetoric*)
David A. Nutter, Ph.D. (*Music*)
Marijane Osborn, Ph.D. (*English*)

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. The program involves studies in history, art, philosophy, literature, drama, music, national languages, religion, rhetoric, and political theory.

The Program. The major is designed to give students a broad view of the period and to allow for the flexibility necessary to accommodate their individual interests. The department offers a series of medieval studies courses providing an excellent introduction to the major, and preparation for advanced work within the individual disciplines. On the upper-division level, each student completes course work in specific areas of history (the fall of Rome to the Renaissance), literature (Old and Middle English, Chaucer, romantic literature, including French, German, Italian, Russian, Latin), philosophy and religion, arts and language, and political thought. In addition, each student must complete a senior thesis on some selected aspect of medieval culture.

Career Alternatives. The major in medieval studies is a liberal arts degree providing the student with a well-rounded education rather than specialized training, and is therefore excellent preparation for the rigors of the professional schools as well as careers in library science, museology, journalism, and teaching.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter

Recommended: Art 1B, History 4A, Philosophy 21, Medieval Studies 20A, 20B, 20C, Religious Studies 10.

Language proficiency is a necessity; courses in Latin and other European languages are strongly recommended, particularly for students planning to pursue graduate studies in the medieval field.

Depth Subject Matter52

History, at least 12 units from History 102B, 121A, 121B, 121C, 201B12

Literature: at least 16 units, including two courses from each of the following16

(a) English 111, 113A, 113B, 150A, 188, 189.

(b) French 115, 141.

(c) German 120, 122.

(d) Italian 113, 115A, 115B, 139B, 140.

(e) Latin 101, 102, 103, 104, 105, 106, 108, 109, 111A, 111B, 111C, 112, 114, 115, 116.

Philosophy and religion, at least 8 units from Philosophy 105, 132, 145, 146, 190; Religious Studies 102, 1108

Arts and language, at least 8 units from Art 176A, 176B, 176C, 177A, 178A, 178B; Dramatic Art 156, German 106; Music 121 (note prerequisite), 199; Rhetoric and Communication 110, 1118
Political thought, at least one course from Political Science 115, 116, 118A4
Senior thesis, Medieval Studies 1904

Total Units for the Major52

Major Advisers. W. McConnell (*German*), Phyllis Justice (*History*)

Minor Program Requirements:

UNITS

Medieval Studies24

The minor in Medieval Studies is designed to be a coherent program of interdisciplinary study. Medieval Studies units may be taken in one or more of the traditional fields of concentration, including art, drama, history, literature, music, national languages, philosophy, political theory, religious studies and rhetoric. Courses must be upper division and chosen from at least two of these subject areas, and they must be within the three periods of Early Medieval Culture, culture of the High Middle Ages, and Medieval transformations. Students may also select a minor with a thematic emphasis.

There is no foreign language requirement for the minor, although knowledge of Latin or a romance language is recommended.

The minor must be designed in consultation with a Department Adviser.

Minor Advisers. D. J. Dutschke (*Italian*), W. McConnell (*German*), 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 preparation: 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 preparation: 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 preparation: 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-F. The Medieval World (4) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours; discussion—1 hour; term paper. Course deals with selected themes from the Middle

Ages; the Fall of Rome to the beginning of the Renaissance. Subjects will vary from year to year and cover such topics as

- ***(A)** The Monastic Orders;
- ***(B)** Origins of Universities;
- ***(C)** The Seven Liberal Arts, and their Significance in the Middle Ages;
- ***(D)** Family and Society;
- ***(E)** Chivalry; and
- ***(F)** Church and State.

General Education credit for course 120E: Civilization and Culture/Non-Introductory. Recommended GE preparation: Medieval Studies 20A, 20B, or 20C, 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)
Mark L. Wheelis, Ph.D., Acting Chairperson of the Department
Department Office, 156 Hutchison Hall
(916-752-0262)

Faculty

Stanley W. Artz, Ph.D., Associate Professor
Paul Baumann, Ph.D., Professor
Robert E. Hungate, Ph.D., Professor Emeritus
Michele M. Igo, Ph.D., Assistant Professor
John L. Ingraham, Ph.D., Professor Emeritus
Daniel J. Klionsky, Ph.D., Assistant Professor
Stephen C. Kowalczykowski, Ph.D., Professor
JaRue S. Manning, Ph.D., Professor

Allen G. Marr, Ph.D., Professor Emeritus
 John C. Meeks, Ph.D., Professor
 Douglas C. Nelson, Ph.D., Associate 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 Emeritus
 Martin L. Privalsky, Ph.D., Associate Professor
 Mark L. Wheels, Ph.D., Senior Lecturer

The Major Programs

Microbiology is the branch of biology which deals with the smallest organisms, a group that includes bacteria, yeasts and other small fungi, algae, protozoa, and viruses. Despite their small size, these ubiquitous organisms are enormously important because of their effect on our environment, our food supply, and our health.

The Program. Both undergraduate major programs provide a balance of studies in microbiology, with appropriate courses in mathematics and physical sciences. The A.B. program emphasizes the biology of bacteria, while the B.S. program includes more biochemistry and related course work. Either program, with judicious course selection, is appropriate for students contemplating a career in medicine, various allied health professions including medical technology, or teaching. The B.S. program is especially well suited for students who want a professional career in microbiology, or who wish to pursue graduate education in a biological science discipline. The choice of a major program and its suitability for particular career options should be discussed with a major adviser.

Choice of College. The Bachelor of Arts degree is offered only by the College of Letters and Science. The Bachelor of Science degree is offered by both the College of Letters and Science and the College of Agricultural and Environmental Sciences. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

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. 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.

Career Alternatives. A bachelor's degree in microbiology is excellent preparation for a career in biotechnology, pharmacology, agriculture, and the food industry. It also provides a strong background for students wishing to continue on to professional studies in medicine and the other health sciences.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	47-51
Biological Sciences 1A, 1B, 1C	15
Chemistry 1A, 1B	10
Chemistry 8A, 8B or 118A, 118B, 118C	6-12
Statistics 13	4
Mathematics 16A-16B or 21A-21B	6-8
Physics 1A, 1B, or 5A, 5B, 5C	6-12
Depth Subject Matter	38-40
Microbiology 102, 102L, 105, 130A	14
Two of the following: Microbiology 110-110L, 120-120L, 130B-130L, 177-177L	10-11
Biochemistry 101A, 101B	6
Microbiology 162 or Veterinary Microbiology 128	3-4

Additional units from: Microbiology 110, 110L, 120, 120L, 130B, 130L, 177, 177L; Biochemistry 101L; Botany 114, 118, 119; Veterinary Microbiology 126, 127	5
Total Units for the Major	85-101

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	61-74
Biological Sciences 1A, 1B, 1C	15
Chemistry 1A, 1B, 1C, 5 or 4A, 4B, 4C	15-19
Chemistry 8A, 8B or 118A, 118B, 118C	6-12
Statistics 13	4
Mathematics 16A, 16B, 16C or 21A, 21B, 21C	9-12
Physics 5A, 5B, 5C	12
Depth Subject Matter	46-48
Microbiology 102, 102L, 105, 130A	14
One of the following: Microbiology 110-110L, 120-120L, 130B-130L, 177-177L	5-6
Microbiology 162 or Veterinary Microbiology 128	3-4
Biochemistry 101A, 101B, 101L	12
Genetics 100	4
Veterinary Microbiology 126	3
Additional units from: Microbiology 110, 110L, 120, 120L, 130B, 130L, 177, 177L; Veterinary Microbiology 127	5
Recommended: Chemistry 107A, 107B, 108; a course in computer programming.	
Total Units for the Major	107-122

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, M.L. Wheels.

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.S. 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; Land, Air, and Water Resources; Plant Pathology; 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 Division of Biological Sciences and Departments of Botany; Epidemiology and Preventive Medicine; Food Science and Technology; Land, Air, and Water Resources; Medical Microbiology; Plant Pathology; and Veterinary Microbiology.

Faculty of the Department of Microbiology also teach or participate in the following courses: Biological Sciences 1A, 10 and 19.

Courses in Microbiology

Lower Division Courses

***2. General Bacteriology (3) I, II.** The Staff
 Lecture—3 hours. Prerequisite: Biological Sciences 1 or 1A. 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.** The Staff
 Laboratory—3 hours. Prerequisite: Chemistry 1A. 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 Microorganisms (4) III. Wheels
 Lecture—3 hours; term paper. Prerequisite: Biological Sciences 10. Survey of the diversity of microorganisms (viruses, bacteria, protists), their metabolism, genetics, and habitats. Emphasis on Importance to humans — role of microorganisms in global element cycles, in food production, and in disease. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: 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. Baumann; III. Marr
 Lecture—4 hours. Prerequisite: Biological Sciences 1 or 1A and Chemistry 8B (may be taken concurrently). Survey of the biology of bacteria and viruses, including bacterial structure, metabolism, physiology, genetics, and evolution; viral structure and replication; the role of bacteria in global element cycles; and the role of microbes in infectious disease. Only two units of credit allowed to students who have previously passed course 2.

102L. General Bacteriology Laboratory (2) I, Pfeiffer; II, III. The Staff
 Laboratory—6 hours. Prerequisite: course 102 (may be taken concurrently). Introduction to principles and laboratory methods employed in working with microorganisms. For students planning to continue study of microbiology, or use microorganisms as tools for study of genetics and biochemistry. Only one unit of credit allowed if course 3 has been taken.

105. Bacterial Diversity (5) II. Pfeiffer, Wheels
 Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 102, 102L, and Biochemistry 101A; Biochemistry 101B recommended. Survey of the major groups of bacteria emphasizing diversity of energy metabolism, morphology and natural history. Includes methods for determination of evolutionary relationships among groups. Isolation and characterization of bacterial strains from various habitats.

110. Bacteriology of Insects (3) 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: course 3 or 102L, 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 alternate 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 character

istics 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. Igo Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Mathematics 16A. Physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and use of mutants in problem solving.

130B. Bacterial Physiology and Genetics (3) III. Artz Lecture—3 hours. Prerequisite: course 130A. Gene regulation. Prokaryotic nitrogen metabolism. Structure and function of the bacterial cell envelope; synthesis of peptidoglycan and lipopolysaccharide; active transport of nutrients; chemotaxis.

130L. Bacterial Physiology Laboratory (3) III. Artz Laboratory—9 hours. Prerequisite: course 130A and either course 3 or 102L. Physiology and genetics of bacteria and bacterial viruses. Isolation and characterization of mutant strains. Mapping of mutations by conjugation and transduction. Studies on control of enzyme synthesis by induction, repression and catabolic repression.

162. General Virology (4) I. The Staff Lecture—4 hours. Prerequisite: Biological Sciences 1A and Biochemistry 101A. 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: course 3 or 102L; course 177 (may be taken concurrently). Isolation of anaerobic bacteria from a number of different natural environments; experiments dealing with certain characteristic physiological and metabolic aspects of anaerobic bacteria. Offered in alternate years.

190C. Undergraduate Research Conference (1) I, II, III. The Staff (Chairperson in charge) Discussion/conference—1 hour. Prerequisite: upper division standing; consent of instructor. Presentation and critical discussion of staff research activities: designed for advanced undergraduate students. May be repeated for a maximum of 3 units of credit when subject matter differs. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge) Internship—3-36 hours. Technical and/or professional experience on or off campus. Supervised by a member of the Microbiology Department faculty. (P/NP grading only.)

194H. Microbiology Honors Research (2) I, II, III. The Staff Independent study—6 hours. Prerequisite: senior standing; eligibility for college honors; completion of six units of 199 in microbiology; consent of department. Continuation of an individual microbiological research project culminating in writing of a senior thesis under a faculty director. (P/NP grading only.)

197T. Tutoring in 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.

***210. Molecular Mechanisms in Microbial Pathogenesis (3)** II. Manning, Hirsh (Veterinary Microbiology and Immunology)

Lecture—3 hours. Prerequisite: course 105 or Veterinary Microbiology 127 and course 162 or Veterinary Microbiology 128 or the equivalent. Study of the molecular mechanisms involved in cytopathogenesis of higher eukaryotic organisms. Emphasis on the alteration or inhibition of cellular metabolism and function by bacteria and animal viruses. Offered in alternate years.

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; II. The Staff Laboratory/discussion—10 hours. Prerequisite: course 130L or Biochemistry 101L; Genetics 100; 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 methylophilic bacteria, with special emphasis on the mechanisms of ATP and reductant generation. Offered in alternate years.

***250. Biology of Yeasts (5)** I. Bisson (Viticulture and Enology), C. Price (Food Science and Technology) Lecture—3 hours; laboratory—6 hours. Prerequisite: consent of instructor. Survey of the genetics, physiology, regulatory mechanisms, structure, ecology and diversity of yeasts and related organisms. Offered in alternate years.

***260. Bacterial Genetic Regulatory Mechanisms (3)** 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 alternate years.

262. Advanced General and Molecular Virology (3) III. Luciw (Medical Pathology), Bruening (Plant Pathology) Lecture—3 hours. Prerequisite: graduate standing. Advanced integrated presentation of animal, bacterial, and plant viruses, including their structure, modes of regulation, expression and replication, and effects on host cells and organisms.

***270. Advanced Animal Virology (3)** III. Manning, Privalsky Lecture—3 hours. Prerequisite: consent of instructor.

Selected advanced topics on biological and biochemical properties of animal viruses. May be repeated for credit. Offered in alternate years.

290C. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge) Discussion/conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

291. Selected Topics in 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. The Staff 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), (916-752-0262)

Faculty. Participating faculty are in the Colleges of Letters and Science and Agricultural and Environmental Sciences, and the schools of Veterinary Medicine and Medicine.

Graduate Study. The Graduate Group in Microbiology offers study and research leading to the M.S. and Ph.D. degrees. The group offers study in general microbiology, microbial physiology, microbial genetics, molecular mechanisms of microbial regulation, molecular mechanisms of microbial pathogenesis, immunology, virology, and recombinant DNA technology. For information on the graduate study and undergraduate preparation for the program contact a graduate adviser or the Chairperson of the group.

Graduate Advisers. J.R. Carlson (*Medical Pathology*); R.B. LaFebvre (*Veterinary Microbiology and Immunology*); C.W. Price (*Food Science and Technology*); 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

Michael P. Tucker, Lt.Col., Chairperson of the Department

Department Office, 125 Hickey Gymnasium
(916-752-0541)

Faculty

Lieutenant Colonel Michael P. Tucker, Professor
Captain Robin B. Friedman, Assistant Professor
Captain Melissa A. Stanley

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, National Guard, 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 (advanced camp) between their third and fourth years of the course. Emphasis is on individual participation, leadership development and the capability to function effectively in positions of significant responsibility.

Two-Year Program

This program is designed for students who have not attended lower division Military Science classes. In lieu of lower division courses an applicant attends a six-week summer camp (basic camp) which is voluntary and carries no military obligation. Applicants are paid for camp attendance and transportation costs. Applications are accepted during the winter and spring terms of the year preceding enrollment in the two-year program. All other provisions explained above for the upper division course apply to the two-year program.

Scholarship Program

The U.S. Army offers four- and three-year Active Duty and two-year Reserve Forces Duty scholarships to students planning to attend or attending UC Davis. The U.S. Army ROTC scholarship pays \$7000 or 80% annually of your college tuition, plus laboratory fees,

on-campus education fees, attendance at Advanced Camp, and a flat rate amount from which you may purchase textbooks, classroom supplies and equipment. Scholarship winners also receive a tax-free subsistence allowance of \$100 a month for 10 months for each year that the scholarship is in effect.

The Army Reserve Officers' Training Corps four-year Active Duty merit scholarships are awarded to qualified high school seniors in a national competition each year. There are two cycles available for submission of the four-year scholarship application. High school juniors can compete for an Early Cycle scholarship by submitting their application complete and postmarked by 15 July between their junior and senior years. Applicants will receive notification of their final status by 1 November. As high school seniors, students compete for the Regular Cycle scholarship by submitting their application complete and postmarked by 1 December. Those applicants not selected in the Early Cycle are considered in the Regular Cycle competition. Applicants will receive notification of their final status by 1 March of their senior year in high school. Interested applicants should see their high school counselor for an application or contact UC Davis, Department of Military Science.

The three-year Active Duty and two-year Reserve Forces Duty scholarships are awarded to college students who are already attending UC Davis or transferring from a Junior College to UC Davis, and have three or two years remaining before graduating with a baccalaureate. Students interested in competing for these scholarships can submit their application beginning in November of each school year. The deadline for submission of an application is 15 January for the two-year scholarship and 15 February for the three-year scholarship. Additionally, students may win a two-year scholarship at the six-week summer camp (basic camp) in the Two-Year Program mentioned above. Students apply for these Army scholarships through the Military Science Department.

DASE Cooperative Program

The Department of the Army Scientific and Engineering (DASE) Cooperative Program is designed to support the U.S. Army's efforts to recruit, employ, and retain a science and engineer skilled work force as both military officers and civilian employees.

Qualified students may receive financial assistance of up to \$5,000 per year to pay for tuition, fees, books, lodging, and meals. Additionally, a \$1,000 per year stipend is paid to ROTC Advanced Course students during their last two years in school.

DASE Cooperative students must work in a Department of the Army (DA) Civilian position for a minimum of 26 weeks, typically divided into two thirteen week periods. At least one work period must be completed during the school year. While working, the DASE student will receive the regular pay and benefits for their grade.

Students must be enrolled full time in an undergraduate program leading to a degree in either science or engineering and enroll, or be enrolled, in the U.S. Army Senior ROTC Program. A first semester freshman applicant needs a high school minimum cumulative grade point average (GPA) of 2.75 on a 4.0 scale and a recommendation from the principal or guidance counselor. Other university applicants must have a 2.0 GPA and a minimum C average in all major fields of study. The DA civilian employers may set their standards above these averages.

Students choose to serve in either the Active Army or a Reserve Forces Component and apply for available DA Civilian positions for a specified period of employment.

For complete information you may contact the Military Science Department or the Planning and Placement Work Learning and Career Center, the Engineering and Physical Science Program Manager.

Leadership Laboratory

During the course of the school year, several 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 Advanced Camp.

Military Qualifications Standards (MQS) System

During the program of study, students will become familiar with the MQS System. It is designed to articulate skills and knowledge that are required of ROTC commissioners to begin military service. The components of the MQS System include: military skills, professional knowledge, and a professional military education.

The military skills component consists of 73 military skills which are categorized into 12 subject areas. They are basic soldiering tasks fundamental to the military professional and serve as the basis for future branch-directed specialty training.

The 24 professional knowledge subjects familiarize cadets with the history, customs and traditions, leadership and ethics, administration, organization, and training of the U.S. Army.

The professional military education component consists of two essential parts—a baccalaureate degree and at least one undergraduate course from each of five designated fields of study. Cadets must take a course in written communication, military history, human behavior, math reasoning, and computer literacy.

Academic Credit

College of Letters and Science. The Bachelor of Arts degree requires the completion of 180 units. Military Science courses are counted in the allowance for electives.

College of Agricultural and Environmental Sciences. The Bachelor of Science degree in agriculture requires the completion of 180 units. Military Science courses are counted in the unit allowance for electives.

College of Engineering. Military Science units are acceptable toward the requirements for the Bachelor of Science degree to the extent of the unrestricted elective units available in the curriculum being followed.

School of Veterinary Medicine. The number of Military Science units acceptable toward the Bachelor of Science degree in Veterinary Medicine is on an 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 (1) I.** Lecture—2 hours. Prerequisite: lower division standing, and consent of instructor. Introduction to leadership theories used in military organizations. Course surveys the duties and responsibilities of junior Army officers, the general environment in which they work, and leadership roles performed. Introduces military map reading skills.
- 13. Introduction to Basic Military Operations (1) III.** Lecture—1 hour. Prerequisite: lower division status. Basic military tactical theories and their application at the individual and squad level. Course introduces military tactical operations, and covers military first aid. Principles of war as introduced in course 11 are applied to offensive and defensive tactics.
- 14A. Introduction to Military Leadership Skills (1/2) I.** Laboratory—2 hours. Prerequisite: lower division sta-

tus and consent of instructor; completion of all previous laboratories. Personal and organizational leadership skills introduced in leadership laboratory. Extensive supervised leadership experiences conducted in a military environment. Basic military skills necessary to function in a leadership role are also covered. (P/NP grading only.)

14B. Introduction to Military Leadership Skills

(1/2) II.

Laboratory—2 hours. Prerequisite: lower division status and consent of instructor; completion of all previous laboratories. Development of leadership and military skills introduced in course 14A is continued with emphasis on the individual's role in the squad, the basic organizational element of the Army. As students gain capabilities, supervisory controls are reduced. (P/NP grading only.)

14C. Introduction to Military Leadership Skills

(1/2) III.

Laboratory—2 hours. Prerequisite: lower division standing and consent of instructor; completion of all previous laboratories. Students demonstrate skill levels required for promotion to non-commissioned officer level. Use of chain of command from company through individual levels emphasized. Interrelationship of squad and platoon organizations is explored. (P/NP grading only.)

21. Military History (2) III.

Lecture—2 hours. Prerequisite: lower division status; course 11 or consent of instructor. Survey of military history from 1900 to present, focusing on World War I, World War II, the Korean War, and the Vietnam War.

22A. Intermediate Military Leadership and Operations: I (2) II.

Lecture—2 hours. Prerequisite: lower division status; course 12 or consent of instructor. Develops and exercises personal military leadership skills in extensive supervised leadership laboratories. Intermediate level military skills necessary for leadership roles as junior non-commissioned officers are developed. Students perform in role of junior non-commissioned officers.

22B. Intermediate Military Leadership and Operations: II (2) I.

Lecture—2 hours. Prerequisite: lower division status; course 22A or consent of instructor. Continuation of course 22A. Individual leadership traits identified in course 22 are studied in more depth enabling each student to improve on targeted weaknesses. 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) III.

Lecture—2 hours. Prerequisite: upper division status; course 22A or consent of instructor. Course addresses different types of power and influence a military

leader may use, reviews counseling techniques, and introduces basic management skills. Instruction provided on the various branches in which a commissioned officer could serve.

132A. Advanced Military Operations (2) I.

Lecture—2 hours. Prerequisite: upper division status; course 22B or consent of instructor. First phase of advanced military tactical operations. Advanced work on topographical maps, navigation, and orienteering techniques. Instruction is also provided on resource planning techniques and military intelligence.

132B. Advanced Military Operations (2) II.

Lecture—2 hours. Prerequisite: upper division status; course 132A or consent of instructor. Continuation of course 132A. Military tactical theories and their application in offense and defense are presented at the platoon and company level. Course covers in-depth analysis of the principles of war related to offensive and defensive operations.

134A. Military Organizational Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students develop interpersonal and management skills by practical application of leadership of military organizations in a supervised leadership laboratory. Advanced-level military skills presented. Students fulfill the roles of senior non-commissioned officers. (P/NP grading only.)

134B. Military Organizational Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. As more complex material is presented in classroom, the laboratory environment becomes more challenging. Students serve as senior non-commissioned officers in squad, platoon and company levels, given appropriate authority and responsibility. (P/NP grading only.)

134C. Military Organizational Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students prepared for advanced summer training experience by extensive requirements to plan, organize and conduct military operations in field environments; individual leadership potential is closely assessed in the laboratory environment. (P/NP grading only.)

141. U.S. Army Management Systems (2) III.

Lecture—2 hours. Prerequisite: upper division status and course 131. Army decision making, personnel and equipment management. Includes command and staff functions, training, intelligence gathering, techniques for the conduct of meetings, and logistics management procedures at unit level.

142. Military Law (2) II.

Lecture—2 hours. Prerequisite: upper division status and course 141. Analysis of the American Military Justice System, the Uniform Code of Military Justice, the Hague and Geneva Conventions, and customary law of war. Includes detailed study of selected procedures of military justice system.

143. Military Ethics and Professionalism (2) I.

Lecture—2 hours. Prerequisite: upper division status and course 142. Profession of arms, its characteristics, uniqueness, roles, and responsibilities. Discussion topics include the professional soldier's responsibilities to the Army and the Nation, and the need for ethical conduct. Case studies are used to develop ethical decision making skills.

144A. Military Training Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, and 141. Develops and exercises the leadership skills necessary to plan, coordinate and conduct a training program through practical application under supervision. Emphasis on analysis of objectives, instructor planning, media utilization and evaluation of learning. Students perform as cadet officers. (P/NP grading only.)

144B. Military Training Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: upper division

status; courses 134A, 134B, 134C, and 141. Requirements for training of all other levels of the cadet corps are given to students for conduct in laboratory environment (under supervision). Students placed in realistic role of junior officer with appropriate level of responsibility. Students perform as cadet staff officers. (P/NP grading only.)

144C. Military Training Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 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). UC Davis' participation is large, with about 30 percent of the corps commuting from that campus. The CSUS 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. Drills and courses are normally offered on Thursday mornings. Field Training is conducted during part of the summer at an active Air Force base between the student's sophomore and junior years 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 after graduation, or serve in a specialty consistent with their academic major, individual goals, and existing Air Force needs. Graduates may request a delay of entry on active duty to continue their education or may apply for Air Force sponsored graduate study to begin immediately upon entry on active duty. Due to firm scheduling requirements for the AFROTC program, students are encouraged to work closely with their academic advisers in planning this academic program.

Application to the AFROTC Program should be no 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 3 1/2-, 3-, 2 1/2-, 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, navigation, meteorology, and nursing.

Music

(College of Letters and Science)

David A. Nutter, Ph.D., Chairperson of the Department

Department Office, 112 Music Building
(916-752-0666)

Faculty

Ross Bauer, Ph.D., Associate Professor
Robert S. Bloch, M.A., Professor
Anna Maria Busse Berger, Ph.D., Assistant Professor
Sydney R. Charies, Ph.D., Professor Emeritus
Andrew D. Frank, M.A., Professor
Paul Hillier, A.G.S.M., Assistant Professor
D. Kern Holoman, Ph.D., Professor
Albert J. McNeil, M.S., Professor Emeritus
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

Elizabeth Blumenstock, Lecturer (*violin, viola*)
 Dona Lee Brandon, M.S.M., Lecturer (*organ*)
 Lois Brandwynne, M.A., Lecturer (*piano*)
 Phebe Craig, M.M., Lecturer (*harpsichord*)
 Diana Dallman, M.M., Lecturer (*viola da gamba*)
 Thomas Derthick, B.M., Lecturer (*string bass*)
 Joel Elias, M.M., Lecturer (*trombone*)
 Sarah Freiberg, D.M.A., Lecturer (*cello*)
 Stephanie Friedman, M.A., Lecturer (*voice*)
 David Granger, M.M., Lecturer (*bassoon*)
 Edward Higgins, M.M., Lecturer (*trumpet*)
 Stanley Lunetta, M.A., Lecturer (*percussion*)
 Peter Nowlen, B.M., Lecturer (*French horn*)
 Deborah Pittman, M.A., Lecturer (*clarinet*)
 Robin Richman, B.M., Lecturer (*flute*)
 Stephen Schultz, M.M., Lecturer (*Baroque flute*)
 Deborah Shidler, B.M.E. (*oboe*)
 Marilyn Swan, B.M., Lecturer (*piano*)

The UC Davis Contemporary Music Players

Ross Bauer, Director
 Robert Samson Bloch, violin and viola
 Thomas Derthick, bass
 Sarah Freiberg, cello
 Peter Nowlen, French horn
 Deborah Pittman, clarinet
 Karen Rosenak, piano
 George Thomson, violin
 Laurel Zucker, flute
 and guest artists

The UCD Faculty Woodwind Quintet

Deborah Shidler, oboe
 David Granger, bassoon
 Deborah Pittman, clarinet
 Robin Richman, flute
 Peter Nowlen, French horn

The Major Program

The Bachelor of Arts degree in music at UCD provides both a broad liberal arts education and thorough training for a career in music. A fundamental grounding in music theory, music history, and performance during the first two years of study permits a music major to focus upon a special interest area in composition, analysis, history, performance, or secondary-school teaching during the last two years of undergraduate work. Approximately one-half of the music student's college course work is in music, including three years of music theory, two years of music history, and participation in performing groups.

Student Performing Activities. The UCD Department of Music offers performance opportunities in the UCD Symphony Orchestra, Early Music Ensemble, Concert Band, University Chorus, Chamber Singers, and in chamber music ensembles. The large performing groups regularly present three concerts each year, while chamber ensembles perform frequently in the weekly Thursday Noon Concerts sponsored by the department. The large performing groups also give concerts in off-campus locations, throughout Northern California, and abroad, including recent tours to Europe, China, the Soviet Union, French Polynesia and Australia.

Facilities. The Department of Music's facilities include a large collection of renaissance, baroque, and modern instruments, an electronic studio, practice and rehearsal rooms, and an excellent music library. The library has holdings of well over 11,000 records, tapes, and CDs, and the collection of books and scores in the main library offers exceptional coverage of all aspects of music.

Career Alternatives. Students graduating with a degree in music are well prepared for careers in teaching (high school, community college, or university levels), research, performance, professional composing, concert management, and music librarianship.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	54
Music 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
Plano 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 (Note: only 3 units of 107 or electronic music may be counted toward the major), 108A, 108B, 111, 112, 113A, 113B, 198, 199	8
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.

Major Advisers. C.A. Reynolds, W.E. Valente.

Minor Program Requirements:

	UNITS
Music	18
A minimum of eighteen units of upper division Music courses	18
Courses chosen with adviser's consent from: Music 107A, 110 (maximum of two courses), 111, 112, 121 (minimum of two courses)	
A maximum of two units in performance courses (Music 130, 141, 142, 143, 144, 145, 146) may count toward the minor.	
Lower-division preparatory work to be determined in consultation with minor advisers.	

Teaching Credential Subject Representative. 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., M.A.T., and Ph.D. degrees. Detailed information regarding graduate study may be obtained from the Graduate Adviser.

Graduate Adviser. A. M. Busse Berger.

Courses in Music

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. The Staff
 Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for beginners in music. Designed for students with career plans where musi-

cal 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. The Staff; II, Valente

Lecture—3 hours; laboratory—1 hour. Fundamentals of music theory, ear-training, harmony, counterpoint, and analysis directed toward the development of listening and writing techniques. Intended for the general student. General Education credit for two-course sequence of non-GE courses (3A-3B) which will satisfy requirement for one course: Civilization and Culture/Introductory.

3B. Introduction to Music Theory (4) I, II, III. The Staff

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. Bloch and staff; III. The Staff

Lecture-discussion—4 hours; practicum—2 hours. Development of music writing and listening skills through the study of music fundamentals, tonal species counterpoint, harmony, score reading, analysis of repertoire. Intended primarily for music majors and minors.

5A-5B-5C. Intermediate Theory (4-4-4) I, II, III. Frank

Lecture-discussion—3 hours; practicum—2 hours. Prerequisite: course 4C. Study of imitative tonal counterpoint and of harmony; keyboard harmony; analysis of repertoire.

10. Introduction to Musical Literature (4) I, II, III. The Staff

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. Busse Berger

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. Busse Berger

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. Busse Berger

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. Nutter

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 4C and 24C; course 5A (concurrently). Intended primarily for majors and minors in music. Historical survey of composers and musical styles from antiquity to around 1400.

25B. Introduction to the History of Music, V (4) II. Nutter

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5A and 25A; course 5B (concurrently). Intended primarily for majors 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. Nutter

Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5B and 25B; course 5C (concurrent-

*Course not offered this academic year.

ly). 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) I.**

The Staff

Lecture—3 hours; listening and discussion—1 hour. A study of the Afro-American rhythm, field hollers, work songs, spirituals, blues, gospel, and jazz; the contrast between West African, Afro-Caribbean, and Afro-Cuban musical traditions.

30A-U. Applied Study of Music: Intermediate (1) I, II, III. The Staff

Performance instruction—1/2 hour; practice—5 hours. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertory; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

31A-U. Applied Study of Music: Intermediate (Individual) Performance Instruction (2) I, II, III.

The Staff

Performance instruction—1/2 hour; independent practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

41. University Symphony (2) I, II, III. Holoman

Rehearsal—4 hours. Prerequisite: admission subject to audition before the first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal, and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

42. University Chamber Singers (2) I, II, III. Hillier

Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

43. University Concert Band (2) I, II, III. Valente

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. May be repeated for credit. (P/NP grading only.)

44. University Chorus (2) I, II, III. Hillier

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

45. Early Music Ensemble (2) I, II, III. Nutter

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

46. Chamber Music Ensemble (1) I, II, III. The Staff (Chairperson in charge)

Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

104A-104B-104C. Advanced Theory (4-4-4) I-II-III.

Bauer

Lecture—4 hours. Prerequisite: course 5C. Twentieth-century compositional procedures: analyses and projects in composition.

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. Bloch

Lecture—2 hours. Prerequisite: course 5C. Techniques of orchestration from study of basic instrumental techniques to analysis of orchestral scores and scoring for various instrumental combinations.

***109. Masterworks in Performance (2) I. Holoman**

Lecture—2 hours. Prerequisite: course 10 recommended. Thorough score study of a single masterwork to be performed on campus during the quarter. Guided listening, selected readings, analysis and study of composer's milieu. Recommended especially for members of the performing ensembles scheduled to present the work.

110A. The Music of a Major Composer:

Beethoven (4) II. Holoman

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Beethoven will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory.

110B. The Music of a Major Composer: Stravinsky (4) I. Frank

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Stravinsky will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory.

***110C. The Music of a Major Composer: Bach (4)**

I. Bloch, Nutter

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Bach will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory.

110D. The Music of a Major Composer: Mozart (4)

III. Reynolds

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 3A-3B. The work of Mozart will be studied in the context of his time and his contemporaries. Lectures, discussion/guided listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory.

111. Choral Conducting (2) II. Hillier

Lecture—2 hours. Prerequisite: courses 4A-4B-4C and consent of instructor. Principles and techniques of conducting choral ensembles.

***112. Instrumental Conducting (2) I. Holoman**

Lecture—2 hours. Prerequisite: courses 4A-4B-4C and consent of instructor. Principles and techniques

of conducting instrumental ensembles. Offered in alternate years.

121. Topics in Music History and Criticism (4) III.

Hillier

Seminar—4 hours (includes selected listening). Prerequisite: courses 4A-4B-4C, 24A-24B-24C, and consent of instructor. Sources and problems of a historical period or musical style selected by the instructor and announced in advance. May be repeated for credit.

122. Topics in Analysis and Theory (4) II. Swift

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) I. The Staff**

Lecture—3 hours; listening—1 hour; selected readings. Prerequisite: course 3A-3B or 10 recommended. Intended for non-majors. Studies in selected areas of non-western music, including appropriate instrumental and performing techniques, analysis of tonal systems, melody, rhythm and musical structures. Emphasis placed on cultural context of the music. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Music 3A-3B or 10.

130A-U. Applied Study of Music: Advanced (1) I,

II, III. The Staff

Performance instruction—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertoire; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

131A-U. Applied Study of Music: Advanced (Individual) (2) I, II, III. The Staff

Performance instruction—1/2 hour; independent practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

141. University Symphony (2) I, II, III. Holoman

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

142. University Chamber Singers (2) I, II, III. Hillier

Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

143. University Concert Band (2) I, II, III. Valente

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. May be repeated for credit. (P/NP grading only.)

144. University Chorus (2) I, II, III. Hillier

Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

145. Early Music Ensemble (2) I, II, III. Nutter
Rehearsal—4 hours. Prerequisite: admission subject
to audition before first class meeting. Rehearsal and
performance of Medieval, Renaissance, and
Baroque music for vocal ensemble and historical
instruments. May be repeated for credit. (P/NP grad-
ing only.)

146. Chamber Music Ensemble (1) I, II, III. The Staff
(Chairperson in charge)
Rehearsal—2 hours; student practice—1 hour. Pre-
requisite: 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,
harpichord, and organ. May be repeated for credit.
(P/NP grading only.)

***190. Senior Seminar in Music** (4) I. The Staff
(Chairperson in charge)
Lecture—4 hours. Prerequisite: courses 5C and 25C,
and consent of instructor; course 104C recommend-
ed. 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 lit-
erature 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. Reynolds
Seminar—3 hours; term paper. Introduction to prob-
lems and techniques of research; practical applica-
tion of music bibliography to questions about signifi-
cant issues in musicology, music theory, and perfor-
mance practice.

***201. Advanced Music Research and Criticism** (4)
II. Swift
Seminar—3 hours; term paper. Study and practice of
expository writing about music. Application of
advanced research techniques in writing for different
purposes, ranging from essays for the general public
to thesis proposals and articles for scholarly journals.

***202. Notation** (4) III. Busse Berger
Seminar—3 hours; term paper. Study of musical
notation; investigation of techniques for editing
Medieval and Renaissance music.

203A-203B-203C. Composition (4-4-4) I. Bauer; II.
Frank; III. Valente
Seminar—3 hours. Technical projects and free com-
position.

204. Advanced Conducting (3) I, II, III. The Staff
(Holoman in charge)
Tutorial—2 hours; practicum—2 hours. Prerequisite:
courses 111, 112, or the equivalent; keyboard skills
appropriate to graduate standing. Technical aspects
of conducting and the broader issues in music history
and analysis that conductors must face before
leading a rehearsal or performance.

***207. Advanced Electronic and Computer Music**
(4) II. Slawson
Seminar—2 hours; plus individual student/instructor
meeting—2 hours. Prerequisite: courses 107A-107B-
107C. Advanced composition of computer and elec-
tronic music with the Sun 3-based computer-music
system and associated facilities.

210A. Proseminar in Music (Theory and Analysis)
(4) I. Swift
Seminar—3 hours; term paper. Voice-leading analy-
sis of tonal music derived from Schenker and pitch-
class set theory. Recent work on compositional
design, generalizations of the concept of interval,
psychologically-oriented music theory, and theories
of durational structure and timbre.

**210B. Proseminar in Music (Musicology and Criti-
cism)** (4) II. Busse Berger
Seminar—3 hours; term paper. Issues and concepts of
music history, including performance practice ques-
tions for specific repertoires and periods; principles,

aims, and methods of archival study; historical theory;
evolution of musical styles; philosophical debates
about goals and aims of the discipline in general.

210C. Proseminar in Music (Ethnomusicology) (4)
III. The Staff
Seminar—3 hours; term paper. Intensive examination
of major trends in ethnomusicology as exemplified
by scholars working in several non-Western cultures.
Ethnomusicological theory, ranging from ethno-
graphic description to metamusicological study
(Seeger) to analysis of individual genres to sociologi-
cal study.

221. Topics in Music History (4) I. Busse Berger;
III. Reynolds
Seminar—3 hours. Studies in selected areas of
music history and theory. May be repeated for credit.

222. Techniques of Analysis (4) II. Bauer
Seminar—3 hours. Analysis and analytical techni-
ques as applied to music of all historical style peri-
ods. May be repeated for credit.

***223. Ethnomusicology (Pacific Cultures)** (4)
Seminar—3 hours; term paper. Court music, religious
music, and popular forms of China, Japan, Korea,
Melanesia, and Indochina. Issues concerning histo-
ry, theoretical constructs, performance practice, and
cultural settings of the music will be stressed. May
be repeated for credit.

299. Individual Study (1-12) I, II, III. The Staff (Hol-
man in charge)
(S/U grading only.)

Teaching Methods Courses

***300. The Teaching of Music** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 1 or the equiv-
alent. Methods of teaching music in grades K-6.

***301. The Teaching of Music** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 5C (or the
equivalent). Methods of teaching music in grades 7-
12.

Instrumental Methods. The courses in this series
consider methods of teaching orchestra and band
instruments, and include repertory and program
planning for secondary schools.

***321A-321B. Stringed Instruments** (1-1) I-II. The
Staff
Discussion—2 hours. Prerequisite: course 4C.

***322. Brass Instruments** (1) III. The Staff
Laboratory—2 hours. Prerequisite: course 4C.
Offered in alternate years.

323A-323B. Woodwind Instruments (1-1) II-III. The
Staff
Discussion—2 hours. Prerequisite: course 4C.

***324. Percussion Instruments** (1) II. The Staff
Laboratory—2 hours. Prerequisite: course 4C. Con-
siders teaching of percussion instruments. Survey
course. Offered in alternate years.

Native American Studies

(College of Letters and Science)

Jack D. Forbes, Ph.D., Program Director
Program Office, TB 113 (916-752-3237)

Committee in Charge

Steve Crum, Ph.D. (*Native American Studies*)
Ines Hernandez, Ph.D. (*Native American Studies*)
Stefano Varese, Ph.D. (*Native American Studies*)
Jack D. Forbes, Ph.D. (*Anthropology, Native Ameri-
can Studies*)
George C. Longfish, M.F.A. (*Native American
Studies*)
David Risling, M.A., Emeritus (*Native American
Studies*)
David A. Robertson, Ph.D. (*English*)
Lenora A. Timm, Ph.D. (*Linguistics*)
Delbert L. True, Ph.D. (*Anthropology*)

Faculty

Steve Crum, Ph.D., Professor
Jack D. Forbes, Ph.D., Professor
Carl N. Gorman, M.F.A., Lecturer Emeritus
Ines Hernandez, Ph.D., Assistant Professor
Sarah Hutchison, M.A., Lecturer Emeritus
George C. Longfish, M.F.A., Professor
David Risling, M.A., Lecturer Emeritus
Stefano Varese, Ph.D., Professor

The Major Program

Native American studies focuses upon the indige-
nous peoples of both North and South America. The
program is interdisciplinary in its approach to the
world of the American Indian and offers a compre-
hensive and comparative perspective.

The Program. Students electing a major in Native
American studies may complete Plan I, Plan II, or
Plan III. Plan I enables students to concentrate
chiefly upon the Native experience in North America
(north of Mexico). Plan II encourages interested stu-
dents to focus upon Meso-America with, however,
some course work integrating Meso-America with
North America and South America. Plan III focuses
upon South America, with some course work inte-
grating that region with areas to the north.

Career Alternatives. Native American studies is
excellent preparation for a professional career such as
teaching, law, human services, health, tribal adminis-
tration, social work, and inter-ethnic relations. Gradu-
ate schools and agencies in these and related areas
are looking for students with broad interdisciplinary
preparation and who possess knowledge and sensi-
tivity relating to ethnic issues and cultural diversity.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter (Plans I, II, and III)	20
Native American Studies 1	4
Native American Studies 32, 33, 55, 70, or three of the above courses and one course from History 17A, History 22, Anthropology 2 or 3	16
Depth Subject Matter (Plans I, II, and III)	16
Native American Studies 130A	4
Native American Studies 130B or 130C	4
Native American Studies 157	4
Native American Studies 180	4
Plan I (North American Emphasis) Preparatory Subject Matter (see above) ..	20
Depth Subject Matter (see above)	16
Two courses from Native American Studies 116, 117, 118, 124	8
Two courses from Native American Studies 101, 181A, 181B, 181C	8
Two courses from Anthropology 113, 134, 141A, 141B, 141C, 172, 173, 174, 175, 176, Geography 120, History 173A	8
One other upper division Native American Studies course, selected in consultation with your major adviser	4
Total Units for the Major, Plan I	64
Plan II (Mexico-Central America Emphasis) Preparatory Subject Matter (see above) ..	20
Depth Subject Matter (see above)	16
Three courses from History 161A, 166A, 166B, Geography 122A	12
Two courses from Anthropology 134, 141B, 174, 175, Native American Studies 161	8
One course from Spanish 129, 135, Art 151	4
One course from Native American Studies 101, 181A, 181B, 181C, or from 107, 188, 191 if specifically focused upon a Meso-American language or topic	4
Total Units for the Major, Plan II	64

Plan III (South American Emphasis)

Preparatory Subject Matter (see above).....	20
Depth Subject Matter (see above).....	16
Three courses from History 161A, 161B, 162, 163A, 163B, 165, Geography 122B.....	12
Two courses from Anthropology 134, 141B, 144, 174, 175, Native American Studies 161.....	8
Two courses from Native American Studies 101, 181A, 181B, 181C, Spanish 149, or from Native American Studies 107, 188, 191 if specifically focused upon a South American language or topic.....	8
Total Units for the Major, Plan III.....	64

Major Adviser. D. Risling.

Minor Program Requirements:

The Native American Studies minor provides an introduction to the Native experience in the Americas by means of exposure to course work dealing with some of the major aspects of Indian life, including history, values, politics, literature, and art.

	UNITS
Native American Studies.....	24
Lower division requirement.....	4
Native American Studies 1 or 10	
Upper division requirement.....	20
Five upper division courses, at least one of which is chosen from each of the follow- ing groups:	
Ethno-History, Native American Studies 130A, 130B, or 130C	
Philosophy and values, Native American Studies 156, 157, or 180	
Politics and current affairs, Native American Studies 116, 117, 118, 124, or 181	
Art and literature, Native American Studies 101, 181A, 161B, or 181C	

Courses in Native American Studies**Lower Division Courses**

- 1. Introduction to Native American Studies (4) I, II, III.** The Staff
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, II, III.** The Staff
Lecture—4 hours. Introduction to American Indian historical and socio-cultural development with emphasis upon the U.S. area and upon those processes such as relations with non-Indians which have contributed to the current condition of Indian people. General Education credit: Contemporary Societies/Introductory.
- 32. Native American Music and Dance (4) I.** The Staff
Lecture/discussion—4 hours. Introduction to the music and dance of the native peoples of the Americas. Students will study secular native music and dance from a cross-section of regions and tribes.
- 33. Native American Art in the U.S. (4) I.** Longfish
Lecture—4 hours. Comprehensive survey of Indian art forms with emphasis upon design, media, and function. Intent is to familiarize the student with a wide range of styles and techniques.
- 34. Native American Art Workshop (4) 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.)
- 46. Orientation to Research in Native American Studies (4) II.** Forbes
Lecture-discussion—3 hours; term paper. Prerequisite: Native American Studies major or minor, or con-

sent of instructor. Introduces students to basic research resources pertinent to Native American subjects available in the region, including libraries, archives, museums, etc. Emphasis is upon learning to use documentary resources or other collections of data. Students will carry out individual projects. Limited enrollment.

55. Americanisms: Native American Contributions to World Civilization (4) II. Varese
Lecture—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.

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 (Forbes in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Contemporary Indian Art (4) II. Longfish
Lecture—4 hours. Prerequisite: course 33. Historical review of contemporary Indian art from 1900 to the present by looking at the two art centers of Oklahoma and Santa Fe. Social pressures that have influenced the imagery that exists today will be examined.

107. Special Topics in Native American Languages (4) I, II, III. The Staff
Lecture-discussion—4 hours. Prerequisite: consent of instructor. Investigation of various subjects in contemporary and historical Native American language studies. May be repeated for credit when a different topic is studied.

***112. History and Culture of the "Five Civilized Tribes" (4) 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 alternate years.

***116. Native American Traditional Governments (4) II.** The Staff
Lecture—4 hours. Prerequisite: course 1; Anthropology 2. Study of selected Native American Tribal Governments, confederations, leagues, and alliance systems. Offered in alternate years.

117. Native American Governmental Decision Making (4) II. The Staff
Lecture—4 hours. Prerequisite: course 116; Political Science 2; Anthropology 123 recommended. Native American governmental and community decision making with emphasis on federal and state programs, tribal sovereignty, current political trends and funding for tribal services. Offered in alternate years.

118. Native American Politics (4) III. 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 alternate 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Native American Studies 1 or 10 or History 17A.

130B. Native American Ethno-Historical Development (4) II. Crum
Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native American ethno-history in North America, 1770-1890. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE

preparation: Native American Studies 1, 10, or 130A; or History 17A or 17B; or Anthropology 2.

130C. Native American Ethno-Historical Development (4) III. Crum

Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native American ethno-history in North America after 1890. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: History 17A, 17B, or Native American Studies 10. Offered in alternate years.

156. Native American Ethics and Value Systems (4) I. Varese

Lecture—4 hours. Prerequisite: upper division standing; course 1. Analysis of Native American systems of values and how these values translate into actual behavior; attention to the problem of implementing traditional values in the twentieth century and the possible impact of native values in modern societies. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Native American Studies 10.

***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 alternate years.

180. Native American Women (4) III. Hernandez
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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Native American Studies 10 and Women's Studies 50.

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 Preparation List. Analysis of works by or about Native Americans including novels and autobiographies, analysis of Native American poetry, oral literature, songs, and tales. (A), the novel and fiction; (B), nonfiction works by native authors; (C), traditional literature and poetry. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

188. Special Topics in Native American Literary Studies (4) I, II, III. The Staff

Lecture-discussion—3 hours; term paper. Prerequisite: upper division standing and consent of instructor. Special topics drawn from Native American literature. May be repeated for credit when a different topic is studied.

***190. Seminar in Native American Studies (2) III.**

The Staff (Forbes in charge)
Discussion—2 hours. Prerequisite: senior standing. Seminar of critical issues faced by Native American people. (P/NP grading only.)

191. Topics in Native American Studies (4) I, II, III. The Staff

Lecture-discussion—3 hours; term paper. Prerequisite: upper division standing and consent of instructor. Selected topics in Native American ethno-history, development, culture, and thought. May be repeated for credit when a different topic is studied.

195. Field Experience in Native American Studies (12) I, II, III. Forbes in charge

Field work—36 hours. Prerequisite: senior standing and major in Native American Studies, completion of lower division major requirements, and course 161. Field work with governmental and community groups, under supervision of faculty adviser and sponsor. Knowledge acquired in other courses to be applied in field work. (P/NP grading only.)

196. Senior Project in Native American Studies (4) I, II, III. Forbes in charge

Discussion—1 hour; independent study—3 hours. Prerequisite: senior standing and major in Native American Studies, course 195 (may be taken concurrently), and consent of instructor. Guided research project that enables student to apply the theory and research principles from major course work. Final product is to be a major senior project or thesis.

197TC. Community Tutoring in Native American Studies (1-5) I, II, III. The Staff (Forbes in charge) Tutorial—3-15 hours. Prerequisite: consent of major committee; upper division standing with major in Native American Studies. Supervise tutoring in community. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Forbes in charge) Prerequisite: consent of instructor. (P/NP grading only.)

Nematology

(College of Agricultural and Environmental Sciences) Howard Ferris, Ph.D., Chairperson of the Department Department Office, 488 Hutchison Hall (916-752-1403)

Faculty

Edward P. Caswell, Ph.D., Assistant Professor
Howard Ferris, Ph.D., Professor
Scott L. Gardner, Ph.D., Assistant Professor
Bruce A. Jaffee, Ph.D., Associate Professor
Harry K. Kaya, Ph.D., Professor (*Entomology*)
Benjamin F. Lowensbery, Ph.D., Professor Emeritus
Armand R. Maggenti, Ph.D., Professor
Dewey J. Raski, Ph.D., Professor Emeritus
Becky B. Westerdahl, Ph.D., Lecturer
Valerie M. Williamson, Ph.D., Assistant Professor

Minor Program Requirements:

UNITS

Nematology	18-20
Nematology 100, 110, and Veterinary Microbiology 132	11
Two or three courses from one of the following areas	7-9
(a) Plant Science: Microbiology 102, Botany 120, 121, Entomology 100, 115, 153, 156, 156L, Soil Science 111, Zoology 112, 142.	
(b) Entomology: Microbiology 102, Botany 120, 121, one upper division Entomology course, Soil Science 100, 111, Zoology 112, 142.	

Minor Adviser. C.Y.S. Peng.

Graduate Study. Graduate degrees specializing in Nematology are offered through the Departments of Entomology and Plant Pathology, and through various Graduate Groups (Biochemistry, Ecology, Genetics, Plant Protection and Pest Management). Refer to the Graduate Division section in this catalog for details.

Courses in Nematology

Upper Division Courses

100. General Plant Nematology (4) I. Ferris Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A or 10. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.

110. Introduction to Nematology (2) II. Maggenti Lecture—2 hours. Prerequisite: Biological Sciences 1B 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 alternate years.

222. Advanced Plant Nematology (3) II. Caswell, Jaffee, Williamson

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent. Review and investigation of relationship between parasitic nematodes and plants, the relationship between nematodes and their environment, and the relationship between nematodes and other biota. Biology of systems explored at the population, organism, and cellular levels. Offered in alternate years.

225. Nematode Taxonomy and Comparative Morphology (5) II. 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 alternate years.

240. Biological Control in Insect and Plant Nematology (2) I, Jaffee, Kaya

Lecture—1 hour; laboratory—3 hours or field trips. Prerequisite: upper-division course in entomology, nematology, or plant pathology. Biological control potential of nematodes against insect pests and of microorganisms against nematode pests. Offered in alternate years.

243. Topics in Cellular and Behavioral Neurobiology (2) III. Mulloney

Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. An advanced examination of several current problems in neurobiology. Topics will vary in different years; may be repeated for credit. (S/U grading only.) (Same course as Zoology 243.)

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.)

283. Neurobiological Literature (1) I, II, III. Mulloney and Wilson

Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in neurobiology. (S/U grading only.) (Same course as Zoology 283.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour. (S/U grading only.)

290C. Advance Research Conference (1) (Research Faculty)

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Planning and results of research programs, proposals, and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group.

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.)

Neurobiology (A Graduate Group)

Martin Wilson, Ph.D., Chairperson of the Group Group Office, 2320 Storer Hall (916-752-7468)

Faculty. The group includes 29 faculty members from fourteen departments in the College of Agricultural and Environmental Sciences, College of Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Neurobiology offers programs of study leading to the Ph.D. degree. Neurobiology is a broad, interdepartmental program with faculty interests ranging all the way from molecular architecture of membrane channel proteins to the acquisition of song by juvenile birds. A major goal of the program is to acquaint students with the diversity of contemporary neurobiology. Details of the program may be obtained from the Group office.

Graduate Advisers. B. Mulloney (*Zoology*), P. Papopone (*Animal Physiology*).

Courses in Neurobiology

Graduate Courses

200LA. Laboratory Methods in Neurobiology (6) I, II, III. The Staff

Laboratory—18 hours. Prerequisite: graduate standing in the Neurobiology Graduate Group. Individual research in the laboratory of a faculty member. Research problems will emphasize the use of contemporary methods and good experimental design. May be repeated for credit.

200LB. Laboratory Methods in Neurobiology (3) I, II, III. The Staff

Laboratory—9 hours. Prerequisite: graduate standing in the Neurobiology Graduate Group. Individual research in the laboratory of a faculty member. Research problems will emphasize the use of contemporary methods and good experimental design. May be repeated for credit.

210. Contemporary Research in Neurobiology (3) I. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in Neurobiology or consent of instructor. Series of lectures by faculty members presenting the intellectual and technical basis for their own research. May be repeated for credit once with consent of instructor.

243. Topics in Cellular and Behavioral Neurobiology (2) III. Mulloney

Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. An advanced examination of several current problems in neurobiology. Topics will vary in different years; may be repeated for credit. (S/U grading only.) (Same course as Zoology 243.)

283. Neurobiological Literature (1) I, II, III. Mulloney and Wilson

Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in neurobiology. (S/U grading only.) (Same course as Zoology 283.)

290C. Research Conference in Neurobiology (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: graduate standing in Neurobiology or consent of instructor; course 299 (concurrently). Presentation and discussion of faculty and graduate student research in neurobiology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Neurology

See Medicine, School of

Neurosurgery

See Medicine, School of

Nutrition

See Nutrition, below; Nutrition (A Graduate Group); Nutrition Science; and Clinical Nutrition and Metabolism under Internal Medicine in Medicine, School of

Nutrition

(College of Agricultural and Environmental Sciences)
Barbara O. Schneeman, Ph.D., Chairperson of the Department

Department Office, 3135 Meyer Hall (916-752-4630)

Faculty

Kenneth H. Brown, M.D., Professor
Andrew J. Clifford, Ph.D., Professor
Kathryn G. Dewey, Ph.D., Associate Professor
M.R.C. Greenwood, Ph.D., Professor
Louis E. Grivetti, Ph.D., Professor (*Nutrition, Geography*)

Fredric W. Hill, Ph.D., Professor Emeritus
Patricia Johnson, Adjunct Professor
Carl L. Keen, Ph.D., Professor (*Nutrition, Internal Medicine*)

Bo L. Lonnerdal, Ph.D., Professor (*Nutrition, Internal Medicine*)

Roger McDonald, Ph.D., Assistant Professor
Jo Ann Prophet, M.S., Lecturer
Robert B. Rucker, Ph.D., Professor (*Nutrition, Biological Chemistry*)

Barbara O. Schneeman, Ph.D., Professor (*Nutrition, Food Science and Technology, Internal Medicine*)

Judith S. Stern, Sc.D., Professor (*Nutrition, Internal Medicine*)

William C. Weir, Ph.D., Professor Emeritus
Frances J. Zeman, Ph.D., Professor Emeritus

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	24
Preparation: plan in advance to include the required course prerequisites.	
Nutrition 101 or 110, plus 111	9
Nutrition 118, 192 (2).....	6
Nutrition 120	4

Physiology 110	5
Replacement courses (see note above): Nutrition 114, 116A-116B, 116AL-116BL.	

Food Service Management	24-25
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Preparation: plan in advance to include the required course prerequisites.

Food Science and Technology 100A-100B, 101A-101B	10
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Food Service Management 120, 120L, 121, 122	11
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Food Service Management 123 or Agricultural Economics 112	3-4
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Replacement courses (see note above): Nutrition 10, 101, 110, 111, 114, 116A-116B, Economics 11A-11B.	
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Nutrition and Food	24
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Preparation: plan in advance to include the required course prerequisites.

Nutrition 101, 111	9
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Nutrition 120	4
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Food Science and Technology 100A, 100B	6
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Physiology 110	5
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Replacement courses (see note above): Nutrition 114, 116A-116B, 116AL-116BL.	
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Nutrition Science	20-21
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Preparation: plan in advance to include the required course prerequisites.

Biochemistry 101A-101B or Physiological Sciences 101A-101B	6-7
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Physiology 110	5
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Nutrition 110, 111	9
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Replacement courses (see note above): Nutrition 114, 115, 116A-116B, 117, 120, 122, 122L, 123, 124, 201, 204.	
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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. The Staff

Lecture—3 hours. Nutrition as a science; historical development of nutrition concepts; properties of nutrients and foods. Not open for credit to students who have taken an upper division course in nutrition. General Education credit: Nature and Environment/Introductory. To receive GE credit, course 11 must be taken in a concurrent or subsequent quarter.

11. Current Topics and Controversies in Nutrition (2) II, III. The Staff

Discussion—1 1/2 hours; oral reports, written reports, term paper. Prerequisite: course 10 (may be taken concurrently). Assigned readings and discussion of topics of current concern and broad interest in contemporary nutrition. Coordinated with course 10. Not open for credit to students who have taken an upper division course in nutrition. General Education credit: Nature and Environment/Introductory. To receive GE credit, course 10 must be taken in a concurrent or previous quarter.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) II. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2, and course 10 recommended. Historical and contemporary overview of culture, food habits, and diet; exploration of the major themes in food habit research; minority food habits; origins and development of dietary practices. General Education credit: Nature and Environment/Introductory.

***93. Public Issues in Nutrition and Food Science** (1) II. Schneeman
Seminar—1 hour. Faculty and invited guest speakers

will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to Nutrition and Food Science for students new to the campus. (P/NP grading only.) (Same course as Food Science and Technology 93.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Introduction to Nutrition and Metabolism (4) I. Lonnerdal

Lecture—4 hours. Prerequisite: Chemistry 8B; Physiology 2 or 110. Introduction to the metabolism of protein, fat, and carbohydrate; the role of vitamins and minerals; food utilization. Not open for credit to students who have taken courses 110 or 111.

110. Principles of Nutrition (5) II. Calvert (Animal Science) and Rucker (Nutrition); III. Hung (Animal Science) and Rucker (Nutrition)

Lecture—5 hours. Prerequisite: Physiological Sciences 101B (preferred) or Biochemistry 101B; a course in physiology or zoology. Fundamental principles of the nutrition of man and other animals. Physiological basis of nutrient requirements for growth, maintenance and production. Physiological basis of nutritional disorders.

111. Human Nutrition (4) III. McDonald
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101 or 110. Nutrition of humans; critical study of nutrient requirements at various phases of life cycle.

112. Nutritional Assessment: Dietary, Anthropometric, and Clinical Measures (2) III. Brown

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 101 or 111 (may be taken concurrently). Methods of nutritional assessment in humans to evaluate dietary intake (dietary records and recalls, food frequency lists), body composition (anthropometry, physiological methods), and clinical signs of malnutrition. Principles of validity and reliability and interpretation of results.

113. Nutritional Assessment: Biochemical Measures (2) I, II. The Staff (McDonald in charge)

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 111. Variety of biologic markers of human nutritional status including hematological, urine, and hair analyses of clinical importance will be demonstrated and evaluated. Emphasizes the precision, accuracy, reliability, and interpretation of the values.

114. Developmental Nutrition (4) II. Keen

Lecture—4 hours. Prerequisite: course 110 or 101; course 111. Role of nutritional factors in embryonic and postnatal development.

115. Animal Feeds and Nutrition (4) II. Brown (Animal Science)

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B, Animal Science 41. Analyses and evaluation of feeds, influences of production, processing and storage methods on nutritive value of feeds. Animal nutrition. Diet formulation.

116A-116B. Diet Therapy (3-3) I-II. The Staff

Lecture—3 hours. Prerequisite: course 111; Physiology 110 (or the equivalent). Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

116AL. Practicum in Diet Therapy (2) I. The Staff
Lecture—1 hour; Laboratory—2 hours; extensive written assignments. Prerequisite: course 116A (may be taken concurrently). Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116A. (Deferred grading only pending completion of 116AL-116BL sequence.)

116BL. Practicum in Diet Therapy (1) II. The Staff
Lecture—1 hour; laboratory—1 hour; extensive written assignments. Prerequisite: course 116B (may be taken concurrently); course 116AL. Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116B. Continuation of course 116AL. (Deferred grading only pending completion of 116AL-116BL sequence.)

117. Experimental Nutrition (5) I. Clifford

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 111; 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 (4) II. Dewey

Lecture—4 hours. Prerequisite: course 101 or 111, course 116A. Nutrition problems in contemporary communities and of selected target groups in the United States and in developing countries. Nutrition programs and policy, principles of nutrition education.

120. Food Habits and their Nutritional Implications (4) I. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division or graduate standing; upper division course in nutrition or 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. Sainz 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 and Conklin (Animal Science)

Lecture—3 hours. Prerequisite: course 110 or 115. Application of principles of nutrition to feeding of finfishes and shellfishes; feeding habits, gastrointestinal anatomy, digestive physiology, aquatic environment, nutrient requirements, diet formulation and quality control, and feeding practices of commercially cultured fishes.

129. Journalistic Practicum in Nutrition (2) III. Stern

Discussion—2 hours. Prerequisite: course 111; a course in written or oral expression or consent of instructor. Critical analysis and discussion of current, controversial issues in nutrition; the use of journalistic techniques to interpret scientific findings for the lay public. Students will be required to write several articles for campus media. Course may be repeated once for credit. Offered in alternate years.

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 Internship—3-36 hours. Prerequisite: one upper division course in nutrition and consent of instructor. Work experience on or off campus in practical application of nutrition, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Nutrition (1-2) I, II, III. The Staff Discussion-laboratory—3 or 6 hours. Prerequisite: Nutrition Science, Dietetics, Community Nutrition or related major. Completion of course 101 or 110 with a grade of B or better. Tutoring of students in nutrition courses, assistance with discussion groups or laboratory sections, weekly conference with instructor in charge of course: written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (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; 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 Nutritional Energetics (2) I. Baldwin Lecture—2 hours. Prerequisite: course 110; Physiological Sciences 101B; Physiology 110 or the equivalent. History of nutritional energetics. Evaluation of energy transformations associated with food utilization. Energy expenditures at cellular, tissue, and animal levels as affected by diet and physiological state. Current and future feeding systems.

203. Advanced Protein and Amino Acid Nutrition (2) III. The Staff (Rogers, Physiological Sciences, in charge)

Lecture—2 hours. Prerequisite: course 110; Physiological Sciences 101B; Physiology 110 or the equivalent. Nutritional significance of protein and amino acids, including studies of the influence of dietary protein on digestion, absorption, metabolism, resistance to disease, and food intake. Study of dietary requirements and interrelationships among amino acids.

204. Mineral Metabolism (2) III. Lonnerdal, Keen Lecture—2 hours. Prerequisite: course 110; Microbiology 2; Biochemistry 101A-101B or Physiological Sciences 101A-101B; Physiology 110. Studies of metabolic functions and nutritional interrelationships involving minerals.

216. Advanced Diet Therapy (3) III. The Staff Lecture—3 hours. Prerequisite: course 116A-116B. Nutrition and disease interrelationships at cellular, tissue, and whole body levels with emphasis on human disease. Critical evaluation of methodology in the study of nutrition in disease states.

218. Advanced Field Work in Community Nutrition (2-12) I, II, III, extra session summer. The Staff Discussion—1 hour; field work. Prerequisite: courses 118, 119; graduate standing; consent of instructor. Directed experience in community nutrition. Organization and implementation of nutrition programs.

219A. International Nutrition (3) II. Brown, Dewey, Pollitt (Applied Behavioral Sciences) Lecture/discussion—3 hours. Prerequisite: upper division course in nutrition or consent of instructor. Epidemiology, etiology, and consequences of undernutrition in developing countries.

219B. International Nutrition (3) III. Brown, Dewey, Pollitt (Applied Behavioral Sciences) Lecture/discussion—3 hours. Prerequisite: upper division course in nutrition or consent of instructor. Nutrition policies and programs in developing countries.

252. Nutrition and Development (3) II. Keen Lecture—3 hours. Prerequisite: courses 201, 202, 203. Relationship of nutrition to prenatal and early

postnatal development. Offered in alternate years.

253. Control of Food Intake (3) III. Rogers (Physiological Sciences), Mendel (Animal Science), Stern (Nutrition)

Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations per quarter. Prerequisite: course 201 or 202 or consent of instructor. Comprehensive study of the biochemical, nutritional, behavioral, and physiological mechanisms controlling food intake. Subject matter will be approached through lectures, laboratory demonstration and discussions where students and staff will critically evaluate the literature. Offered in alternate years.

254. Applications of Systems Analysis in Nutrition (3) I. Baldwin (Animal Science)

Lecture—2 hours; discussion—1 hour. Prerequisite: course 202, Physiological Sciences 205A-205B or the equivalent. Quantitative aspects of digestion and metabolism; principles of systems analysis. Evolution of models of energy metabolism as applied in current feeding systems. Critical evaluations of mechanistic models used analytically in support of nutritional research. Offered in alternate years.

***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 alternate years.

257. Selected Topics in Nutritional and Hormonal Control of Nitrogen Metabolism (2) I. Klasing (Avian Sciences), Calvert (Animal Science)

Lecture—2 hours. Prerequisite: courses 201 through 204; Physiological Sciences 205A-205B or the equivalent. Quantitative and qualitative aspects of nitrogen metabolism; critical evaluation of dietary intake, hormones and diet-hormone interactions which affect nitrogen metabolism, including protein synthesis-degradation, amino acid synthesis-catabolism, nitrogen transport-excretion, depending on current literature. Offered in alternate years.

258. Field Research Methods in International Nutrition (3) II. Brown, Dewey, Pollitt (Applied Behavioral Sciences)

Lecture/discussion—3 hours. Prerequisite: graduate standing or consent of instructor. Issues and problems related to implementation of nutrition field research in less-developed countries, including ethics; relationships with local governments, communities, and scientists; data collection techniques and quality assurance; field logistics; research budgets; and other administrative and personal issues. Offered in alternate years.

290. Beginning Nutrition Seminar (1) I, II. The Staff Seminar—2 hours. Prerequisite: first-year graduate standing. Discussion and critical evaluation of topics in nutrition with emphasis on literature review and evaluation in this field.

290C. Research Conference (1) I, II, III. The Staff (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 (Baldwin 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.

tion; 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 Meyer Hall (916-752-2512)

Faculty. Faculty are drawn from the Colleges of Agricultural and Environmental Sciences, and Letters and Science, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees. Research activities in nutrition include work with humans and with laboratory, domestic, and wild animals. Areas of specialization include: the effect of diet on energetics and intermediary metabolism; studies on enzymatic adaptation, community nutrition, ruminant nutrition, amino-acid requirements and utilization; nutrient balance and food intake regulation; biological antioxidants; food toxicants; mineral and vitamin nutrition; various anomalies of pre- and postnatal development; parenteral nutrition; the application of biomathematics to nutritional analyses; human and animal dietetics; and international nutrition. For detailed information regarding these programs, address the chairperson of the group.

Graduate Advisers. Consult the Nutrition Graduate Group Office.

Nutrition Science

(College of Agricultural and Environmental Sciences)

The Major Program

The study of nutrition encompasses all aspects of the collection, preparation, and consumption of food. Also important in the study of nutrition are the biochemical reactions that take place within the body's cells to utilize these nutrients. This is the level at which the nutrition science major explores the general subject of nutrition.

The Program. While students may elect to take courses concerning the social, psychological, economic, or cultural aspects of nutrition, the bulk of the course work making up the major consists of courses in the sciences. Nutrition as it is taught on the Davis campus is a biological science and requires a complete background in chemistry and biology, along with physics and calculus. These courses are generally completed during the first two years, and along with biochemistry, must be completed before most nutrition classes can be taken. Nutrition science students go on to study nutrition in depth during their junior and senior years.

Career Alternatives. The nutrition science major is excellent preparation for technical work in nutrition in

animal, food, and pharmaceutical industries. It also provides a strong background for technical writing or health education. Students who wish to continue their studies are well prepared for professional study in nutrition, dietetics, medicine, and other health sciences.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	59-61
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (1A-1B-1C-5; and 8A-8B or 128A-128B and 129A).....	25-27
Computer science (Computer Science Engineering 10 or Agricultural Science and Management 21).....	3
Mathematics (Mathematics 16A-16B).....	6
Physics (Physics 1A-1B).....	6
Statistics (Statistics 13 or Agricultural Science and Management 150).....	4
Breadth/General Education	24
Satisfaction of General Education requirement plus additional course work in social sciences and humanities	
Depth Subject Matter	26-29
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
Restricted Electives	42
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	16-22
Total Units for the Degree	180

Major Adviser. B. L. Lonnerdal.

Advising Center for the major is located in 1151 Meyer Hall (916-752-2512).

Graduate Study. The Department of Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees in Nutrition. For information on graduate study contact the graduate adviser. See also the Graduate Division section in this catalog.

Graduate Adviser. See *Class Schedule and Room Directory*.

†To fulfill the academic requirements for an internship in Dietetics, choose the following courses from the categories in which they appear above: English 1 or 3, Psychology 1, Rhetoric and Communication 1, Sociology 1 or 3 or Anthropology 2, Economics 1A or 1B, Food Science and Technology 100A, 100B, 101A, 101B, Nutrition 110, 111, 113, 116A, 116B, 116AL-BL, 118, 190. The following courses must be added: Agricultural Economics 112; Food Service Management 120, 120L, 121, 122, 123; Applied Behavioral Sciences 173 or Education 110 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.

Obstetrics and Gynecology

See Medicine, School of

Ophthalmology

See Medicine, School of

Organizational Studies

See Sociology

Orientation

(College of Agricultural and Environmental Sciences)

Course in Orientation

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 (916-752-1385)

Faculty

Mark L. Anderson, D.V.M., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*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
 James S. Cullor, D.V.M., Ph.D., Assistant Professor
 Donald L. Dungworth, B.V.Sc., Ph.D., Professor
 Robert J. Higgins, B.V.Sc., M.Sc., Ph.D., Associate Professor
 Charles A. Holmberg, D.V.M., Ph.D., Associate Professor
 Bill Johnson, D.V.M., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
 Peter C. Kennedy, D.V.M., Ph.D., Professor
 Andrew A. Lackner, D.V.M., Ph.D., Assistant Adjunct Professor (*Pathology, California Primate Research Center*)
 Linda J. Lowenstine, D.V.M., Ph.D., Associate Professor
 N. James MacLachlan, B.V.Sc., Ph.D., Associate Professor
 Carol U. Meteyer, D.V.M., B.S., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
 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
 Deryck H. Read, B.V.Sc., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
 H.L. Shivaprasad, M.S., B.V.Sc., Ph.D., Assistant Professor of Clinical Diagnostic Pathology (*California Veterinary Diagnostic Laboratory*)
 Anthony A. Stannard, D.V.M., Ph.D., Professor (*Pathology, Medicine*)
 Dennis W. Wilson, D.V.M., M.S., Ph.D., Associate 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: 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 alternate 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 alternate years.

***286A-286B-286C. Selected Topics in Advanced Special Pathology** (2-11) I, II, III. The Staff (Dungworth in charge)
 Lecture—variable. Prerequisite: graduate standing, DVM degree, or final-year veterinary student. Varied topics. See department for details. (Deferred grading only, pending completion of sequence.) Offered in alternate 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 alternate 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 (Wilson in charge)
 Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Discussion of selected cases based on records and slides. Defense of diagnoses. (S/U grading only.)

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. Comparative Pathology Conference (1) I, II, III. Lowenstine
 Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Discussion of selected topics in comparative pathology based on currently available case materials from fish, laboratory animals, zoo and wild animals and non-human primates. Given jointly by the Departments of Pathology in the Medical and Veterinary Schools and the California Primate Research Center. (S/U grading only.)

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 Medical Pharmacology and Toxicology in 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)

David E. Hinton, Ph.D., Acting Chairperson of the Group
 Group Office, 4111 Meyer Hall (Department of Environmental Toxicology, 916-752-4516)

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 the Schools of Medicine and Veterinary Medicine, and the College of 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. Areas of research specialization are broad in scope and include analytical pharmacology and toxicology, clinical pharmacology and toxicology, ecotoxicology, food/nutritional toxicology, genetic and development pharmacology and toxicology, neuropharmacology and toxicology, reproductive pharmacology and toxicology, and respiratory pharmacology and toxicology. For detailed information on the program of study, contact the appropriate graduate adviser or the group chairperson.

Graduate Advisers. C.G. Plopper (*Veterinary Pharmacology and Toxicology*), A.J. Hance, (*Pharmacology*), F. Matsumura (*Environmental Toxicology*), B.W. Wilson (*Environmental Toxicology*).

Courses in Pharmacology and Toxicology

Graduate Courses

201. Principles of Pharmacology and Toxicology I (5) I. Miller (*Environmental Toxicology*)
 Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3 hours. Prerequisite: Biochemistry 101B, Physiology 110. Basic concepts underlying metabolic fate of xenobiotics, receptor and cell biology, and chemotherapy for cancer and infectious disease. Specific topics include fate processes, disposition kinetics, dose-response relationships, cellular toxicity and oncogenes.

202. Principles of Pharmacology and Toxicology II (5) II. Buckpitt (*Veterinary Pharmacology and Toxicology*)
 Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3 hours. Prerequisite: satisfactory completion of course 201. Mechanisms of action, pharmacologic and toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs.

203. Principles of Pharmacology and Toxicology III (5) III. Stark (*Pharmacology*)
 Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3 hours. Prerequisite: courses 201 and 202. Mechanisms of action, pharmacologic, toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs. Ecotoxicity, risk assessment and epidemiology.

230. Advanced Topics in Pharmacology and Toxicology (1-3) I, II, III. The Staff
 Lecture-discussion-seminar—1 hour each (course format can vary at option of instructor). Prerequisite: course 201 and consent of instructor. In-depth coverage of selected topics for graduate students in Pharmacology-Toxicology and related disciplines. Topics determined by instructor in charge for each quarter.

290. Seminar (1) I, II, III. The Staff
 Current topics in pharmacology and toxicology. (S/U grading only.)

Philosophy

(College of Letters and Science)

Michael V. Wedin, Ph.D., Chairperson of the Department

David I. Copp, Ph.D., Acting Chairperson of the Department (1991-92)

Department Office, 409 Surge IV (916-752-0607)

Faculty

William H. Bossart, Ph.D., Professor
 David I. Copp, Ph.D., Professor
 Michael R. Dietrich, Ph.D., Assistant 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., Associate Professor
 Michael Jubien, Ph.D., Professor
 Jeffrey King, Assistant Professor
 John F. Malcolm, Ph.D., Professor
 George J. Matthey II, Ph.D., Associate Professor
 Paul Teller, Ph.D., Professor
 Michael V. Wedlin, Ph.D., Professor
 Richard A. Wollheim, M.A., Visiting Professor

The Major Program

Philosophy is the study of conceptual problems that pertain to the nature of knowledge, reality, and human conduct.

The Program. The Department of Philosophy offers courses in such areas as the theory of knowledge, metaphysics, logic, ethics, and aesthetics. In addition, upper division course work is given in the fields of philosophy of 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.

Career Alternatives. Many students major in philosophy with a plan to do graduate work and teach philosophy, or as background training for other professions. Philosophy majors have done extremely well in law schools and medical schools, for example. Also, many philosophy majors go on to advanced work in other academic areas in the humanities and social sciences; graduates may also go into such fields as government, the ministry, publishing, social work, and even business.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	16
Philosophy 12, 21, 22, 23.....	16
Depth Subject Matter	36
Upper division units in Philosophy selected with approval from the major adviser.....	36
Total Units for the Major	52

Major Advisers. G.J. Matthey, J.F. Malcolm.

Minor Program Requirements:

Students wishing to minor in Philosophy may choose a general minor or a minor specializing in logic. There are no specific courses required for the general minor, so students may create a program to suit their own interests, subject to the approval of the minor adviser. The range of choice in the logic specialization is limited to the courses listed.

	UNITS
Philosophy—General	20
20 upper division units in philosophy, chosen in consultation with the minor adviser. In special cases, the minor adviser may allow the substitution of lower division units for no more than 4 upper division units.	
Philosophy—Logic	20
Philosophy 12 or Mathematics 108 ...4	

Philosophy 112.....	4
Select units from Philosophy 131, 132, 133, 134, 135	12

Minor Adviser. R.A. Arbin.

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. M. Jubien.

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 papers emphasized. Not open to students who have completed course 5.

***10A-G. Themes in Philosophy (4) I, II, III.** The Staff
 Lecture-discussion—3 hours; papers or written reports. Introductory study of related problems in an area of philosophical interest. Sections to be offered: (A) Knowledge and Existence; (B) Self and Mind; (D) Morals and Politics; (E) Philosophy East and West; (G) Science and Human Nature. General Education credit for courses 10B, 10D: Civilization and Culture/Introductory.

12. Introduction to Logic (4) I. Teller

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.

13. The Person (4) II. Wollheim

Lecture—3 hours; discussion—1 hour. Examination of the concept of the person, that is, of our intuitions

about what persons are, e.g., that persons are agents, that they have a distinct psychology, that they are rational, that they are language-users, that they are mortal. General Education credit: Civilization and Culture/Introductory.

***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.

17. Historical Introduction to Political Philosophy (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to problems in political philosophy through the reading of classic texts by such philosophers as Plato, Hobbes, Locke, and Marx. Problems to be discussed may include the nature of justice, the right of rebellion, and the defensibility of capitalism. General Education credit: Civilization and Culture/Introductory.

21. History of Philosophy: Ancient (4) I. Malcolm
 Lecture—3 hours; discussion—1 hour. Survey of Greek philosophy with special attention to the Pre-Socratics, Plato, and Aristotle. General Education credit: Civilization and Culture/Introductory.

22. History of Philosophy: Seventeenth Century (4) II. Matthey

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.

***24. Introduction to Ethics (4) II.** The Staff

Lecture—3 hours; discussion—1 hour. Reading of historical and contemporary works highlighting central problems in ethical theory. Why should we be moral? What is moral behavior? How have social ideas, class bias, and gender roles affected our conception of virtue? General Education credit: Civilization and Culture/Introductory.

31. Appraising Scientific Reasoning (4) II. Dietrich
 Lecture—3 hours; discussion—1 hour. Introduction to scientific hypotheses and the kinds of reasoning used to justify such hypotheses. Emphasis on adequate justification, criteria, and strategies for distinguishing scientific from pseudoscientific theories. Concrete historical and contemporary cases. General Education credit: Civilization and Culture/Introductory or Nature and Environment/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—3 hours; discussion—1 hour. Prerequisite: one course in philosophy recommended. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom, and determinism. Views of the nature and method of metaphysics. Anti-metaphysi-

cal arguments. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: 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 recognition, imagination, truth and error, belief and knowledge. Types of epistemology. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Philosophy 1, 22, or 23.

103. Philosophy of Mind (4) III. King
Lecture-discussion—3 hours; term paper. The relation between mind and body, our knowledge of other minds, and the explanation of mental acts. Discussion of such concepts as action, intention, and causation.

104. Introduction to Philosophy of Science (4) I. The Staff
Lecture/discussion—3 hours; term paper. Prerequisite: course 12 or 31. Introduction to philosophy of science: logic of scientific explanation, theory testing and confirmation, reductionism, theory structure, laws, scientific change. Concepts and theories central to various natural sciences will be used in illustration of key ideas. Not all topics will be equally emphasized.

***105. Philosophy of Religion (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in philosophy recommended. Logical, metaphysical, epistemological, and existential aspects of selected religious concepts and problems. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Philosophy 1 or Religious Studies 1, 2, 21, or 40.

***106. Science and Metaphysics (4) I.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy or consent of instructor. Intensive study of topics in metaphysics to which the results of modern science are or appear to be relevant: the nature of time, causation, determinism, physicalism, realism.

107. Philosophy of the Physical Sciences (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: one philosophy course or a science background recommended. Nature of testability and confirmation of scientific hypotheses; nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Philosophy 1, 22, or 23.

108. Philosophy of the Biological Sciences (4) II. Griesemer; III. Dietrich
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 preparation: (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.

***110. An Historical Introduction to the Philosophy of Science (4) II.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy. Several general topics in the philosophy of science introduced and discussed in the context of actual episodes in the development of the natural sciences. Impact of these scientific developments on philosophical thought of the immediately following historical period.

***111. Philosophy of Space and Time (4) II.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: one upper division philosophy course. Philosophical problems of space and time. The philosophical implications of space-time theories, such as those of Newton and Einstein. Topics may include the nature of geometry, conventionalism, absolutist versus relationist views of space and time, philosophical impact of relativity theory.

112. Intermediate Logic (4) II. Teller
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. The Staff
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) III.** Copp
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.** The Staff
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) III. The Staff
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 preparation: Political Science 2.

121. Topics in Metaphysics (4) II. Jubien
Lecture-discussion—4 hours. Prerequisite: course 101. Examination of up to three topics in metaphysics, e.g., fatalism; necessity; identity; ontological categories; minds, bodies, and persons; space and time; freedom and determinism.

122. Topics in Theory of Knowledge (4) III. Matthey
Lecture-discussion—4 hours. Prerequisite: course 102. Examination of one or more topics in theory of knowledge, such as belief, skepticism, justification.

123. Aesthetics (4) II. Wollheim
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Nature of art, of artistic creation, of the work of art, and of aesthetic experience; nature and validity of criticism; relations of art to its environment.

***127. Philosophy and Economics (4) III.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: one upper division course in philosophy. Study of issues at the intersection of economics and moral and political philosophy, e.g., the nature of value, the nature of justice, the nature of rationality, the measurability of human well-being.

***131. Philosophy of Logic and Mathematics (4) II.** Jubien
Lecture-discussion—3 hours; term paper. Prerequisite: course 12 or one course for credit in mathematics. Nature of formal systems and mathematical theories. Selected topics include logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of

geometry; philosophical implications of Gödel's incompleteness results.

***132. History of Logic (4) II.** Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy or logic recommended. Overview of the chief developments in the history of logic.

133. 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.

***134. Modal Logic (4) III.** Matthey
Lecture—3 hours; discussion—1 hour. 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) III.** 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.

137. Philosophy of Language (4) I. King
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; term paper. 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.** The Staff
Lecture-discussion—4 hours. Prerequisite: courses 21, 22, or 23 recommended. Idealism of Hegel, the pessimism of Schopenhauer, Marxism, the irrationality of Kierkegaard, Nietzsche and Dostoevsky. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: 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 Analytic Philosophy (4) II. King
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy. Consideration of central issues such as meaning/reference, analytic/synthetic, reductionism, formal and ordinary language, essential properties, ontological commitment, possible world semantics; influential works by philosophers such as Russell, Moore, Wittgenstein, Austin, Carnap, Quine, Putnam, Kripke, van Fraassen.

***158. Phenomenology and Existentialism in Germany (4) 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.

***160. Pre-Socratics (4) III.** Malcolm
Lecture-discussion—3 hours; term paper. Prerequisite: course 21. Study of the metaphysical views of such pre-Socratic figures as the Milesians, the Pythagoreans, Heraclitus, Parmenides, Empedocles, Anaxagoras, and the atomists.

161. Plato (4) I. Malcolm
Lecture-discussion—3 hours. Prerequisite: course 21.

162. Aristotle (4) III. Malcolm
Lecture-discussion—4 hours. Prerequisite: course 21 or consent of instructor.

***168. Descartes (4) II.** Friedman
Lecture-discussion—4 hours. Prerequisite: course 22.

169. Spinoza (4) III. Friedman
Lecture-discussion—4 hours. Prerequisite: course 22.

***170. Leibniz (4) III.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: course 22.

***172. Locke and Berkeley (4) I.** Matthey
Lecture—4 hours. Prerequisite: course 23. Examination of Locke's *Essay Concerning Human Understanding* and Berkeley's *Principles of Human Knowledge* and *Three Dialogues*. Topics include abstract ideas, existence of matter, primary and secondary qualities, the existence of God, and the nature of scientific knowledge.

***174. Hume (4) III.** The Staff
Lecture-discussion—4 hours. Prerequisite: course 23 recommended.

175. Kant (4) I. Bossart
Lecture-discussion—4 hours. Prerequisite: course 23.

***176. Kant's Ethics (4) II.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: course 175 or one course in ethics. Intensive examination of the moral and political thinking of Immanuel Kant.

177. Hegel (4) II. Bossart
Lecture-discussion—4 hours. Prerequisite: course 23 and 175 recommended.

***190. Special Topics in the History of Philosophy (4) III.** The Staff
Lecture—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated for credit.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Metaphysics (4) III. Jubien
Seminar—4 hours.

202. Theory of Knowledge (4) I. Friedman
Seminar—4 hours.

***206. Philosophical Argumentation (4) I.** The Staff
Seminar—3 hours; short papers. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

207. Philosophy of Physics (4) I. The Staff
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. An intensive treatment of one (or more) topic(s) in the philosophy of physics, such as foundations of spacetime theories, the interpretation of quantum mechanics, foundations of statistical mechanics. May be repeated for credit with consent of instructor.

208. Philosophy of Biology (4) I. Griesemer
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. Intensive treatment of one or more general topics in the philosophy of biology, such as foundations of evolutionary theories, reductionism in biology, sociology, and cultural evolution. May be repeated for credit with consent of instructor.

210. Philosophy of Science (4) II. Teller
Seminar—3 hours; term paper. Prerequisite: graduate standing in philosophy or consent of instructor. Treatment of one or more general topics of current interest in the philosophy of science, such as scientific explanation, theories of confirmation, scientific realism, reduction in physics and biology. Course may be repeated for credit with consent of instructor.

***212. 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.

214. Ethics (4) II. Copp
Seminar—3 hours; term paper.

***217. Political Philosophy (4) I.** The Staff
Seminar—3 hours; term paper. Prerequisite: graduate student standing. Advanced study of issues in political philosophy. May be repeated for credit with consent of instructor.

***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) I. Bossart
Seminar—3 hours. Special topics in the history of philosophy.

***293. The Emotions (4) II.** Wollheim
Seminar—3 hours; term paper. Prerequisite: graduate standing; open to undergraduates with consent of instructor. Considers the emotions in their full variety. Relates emotion to desire, to belief, to sensation, to behavior, and to rationality. Cultural interpretations of emotion will be reviewed. Ancient and modern writers will be read. Offered in alternate years.

298. Group Study (1-5) I, 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)

Keith R. Williams, Ph.D., Chairperson of the Department

Department Office, 264 Hickey Gymnasium
(916-752-0511)

Faculty

- William C. Adams, Ph.D., Professor
- Richard L. Bell, Ph.D., Professor (*Chemical Engineering*)
- Edmund M. Bernauer, Ph.D., Professor Emeritus
- G. Robert Biggs, B.A., Associate Supervisor
- Bobbie J. Bolden, M.A., Associate Supervisor
- Stephen T. Bronzon, M.S., Lecturer
- Joseph E. Carlson, M.A., Supervisor
- Jere H. Curry, M.A., Supervisor
- Simon Davies, Ph.D., Lecturer
- Kathleen M. DeYoung, B.A., Associate Supervisor
- Robert L. Foster, M.A., Supervisor
- Pamela L. Gill-Fisher, M.A., Supervisor
- Raymond S. Goldbar, M.A., Supervisor
- Jerry W. Hinsdale, A.B., Supervisor
- Jorja E. Hoehn, M.S., Lecturer
- Robert G. Holly, Ph.D., Associate Supervisor
- Barbara A. Jahn, M.S., Supervisor
- Susan E. Jennings, Ph.D., Lecturer
- Charles R. Kovacic, Ed.D., Professor Emeritus
- Willard S. Lotter, Ed.D., Senior Lecturer
- Paul A. Molé, Ph.D., Associate Professor

John E. Nelson, M.A., Lecturer
Marlene F. Piper, Ed.D., Associate Supervisor
Melvin R. Ramey, Ph.D., Professor (*Civil Engineering*)

E. Dean Ryan, Ed.D., Professor Emeritus
Joe L. Singleton, M.A., Supervisor
Nancy E. Sloum, M.A., Lecturer
James L. Sochor, Ed.D., Supervisor
Phillip S. Swimley, M.A., Supervisor
Jon E. Vochatzer, M.S., Supervisor
Keith R. Williams, Ph.D., Associate Professor
Robert A. Williams, M.A., Lecturer
Suzanne C. Williams, M.S., Supervisor

The Major Program

The major in physical education provides a broad, scholarly understanding of human movement.

The Program. The undergraduate major may select either the Bachelor of Arts or the Bachelor of Science degree program. The Bachelor of Arts is designed primarily for those students who desire a liberal arts program with a broadly based lower division curriculum. This program permits specialization in either the biological or psychological aspects of physical education, and is most appropriate for those who intend to pursue careers in coaching, teaching, or in community/corporate exercise programs, and for those intending graduate study in the behavioral aspects of sport and exercise.

The Bachelor of Science program is designed for students desiring a more intense curriculum in the natural sciences. It involves more extensive physical and life science preparation in lower division courses, and requires additional upper division course work more specific to either biomechanics or exercise physiology. This degree program provides preparation for graduate study in exercise and sport science, for careers in the allied health sciences, and for professional schools in medicine, physical therapy, and podiatry.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	23-24
Biological Sciences 1A	5
Chemistry 1A	5
Physical Education 45	3
Physics 1A	3
Psychology 1 or 15	3-4
Statistics 13	4
Depth Subject Matter	47
Cell Biology and Human Anatomy 101	4
Cell Biology and Human Anatomy 101L	2
Physical Education 101, 102, 103, 104, 105	16
Physiology 110	5
Minimum of 12 upper division units in physical education chosen with approval by a major adviser	12
<i>Biological emphasis:</i>	
Students electing this emphasis must select a minimum of 9 units from Physical Education 110, 111, 112, 113, 115, 117, or 118.	
<i>Psychological emphasis:</i>	
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 course work may be used to fulfill this requirement.	
Total Units for the Major	70-71

*Course not offered this academic year.

Recommended

Students interested in the biological emphasis of physical education are strongly urged to take Chemistry 8A, 8B.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	53-59
Anthropology 1.....	4
Biological Sciences 1A.....	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.....53

Cell Biology and 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: Physiological 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, 117, 118.

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, R. G. Holly, S.E. Jennings, P. A. Molé, K. R. Williams.

Teaching Major. The teacher-training curriculum in physical education requires courses in addition to the departmental major requirements.

Minor Program Requirements:

	UNITS
Physical Education	18

At least 18 upper division units in physical education from one of three options..18

a. Biomechanics

- 1) Physical Education 103 and one course from 101, 102, 104, 105
- 2) Minimum of two courses from Physical Education 113, 115, 125
- 3) Additional courses to complete a total of 18 upper division units.

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. See also the section on the Teacher Education Program.

Graduate Study. A program of study and research leading to the M.A. or M.S. degree is available in physical education. For detailed information regarding graduate study, write to the Graduate Adviser, Department of Physical Education. See also the Graduate 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 (1/2) I, II, III. The Staff (Chairperson in charge)
Laboratory—2 hours. Sections in: a) sports skills, rules and strategy; b) physical fitness and personal health; c) recreation; d) dance, and e) intercollegiate athletics. May be repeated for a total of 6 units. (P/NP grading only.)

2. Principles of Basic Exercise Conditioning (2) I, 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 (— in charge)
Lecture—1 hour; laboratory—1 hour. An introduction to the basic principles and practices that fulfill the prerequisites for advanced study in First Aid and Emergency Medical Services. Upon successful completion of course the Standard Red Cross Certificate is awarded.

7. Professional Physical Education Activities: Men and Women (1) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; or laboratory—2 hours. Fundamental skills for: a) coaching competitive athletics; b) classroom teaching and coaching, and c) classroom teaching and officiating. May be repeated for a total of six units.

***15. Administration of Intramural Sports (2) II.** Colberg
Lecture—2 hours. Planning and administering intramural sports programs at the high school and college level.

25. Theory of Lifesaving and Water Safety (2) I, II, III. 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/her own life or the life of another in an aquatic emergency. (American Red Cross Advanced Lifesaving Certificate awarded upon successful completion of necessary requirements.)

27. Training Course for Water Safety Instructors (2) III. Hinsdale

Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced swimming (course 1) or consent of instructor; course 5 and current Advanced Life-Saving Certificate. Theoretical knowledge and practical experience necessary for the organization and teaching of swimming and lifesaving classes. (American Red Cross Water Safety Instructor's Certificate awarded upon successful completion of necessary requirements.)

29. Basic Scuba (2) I, III. Morris

Lecture—2 hours; laboratory—2 hours. Prerequisite: good physical condition, ability to pass preliminary swim test. Introduction to basic knowledge required for scuba diving, function and maintenance of equipment, physics and physiology of diving, diver first aid and CPR, oceanography and marine life, and underwater communication. Pool and open water sessions available for certification. (P/NP grading only.)

35A. Dance Composition (2) I. Bolden

Laboratory—5 hours. Prerequisite: course 1, modern jazz or jazz dance techniques, or consent of instructor. Composing phrases of movement with a knowledge of elements involved in the craft of choreography: design, dynamics, rhythm, motivation and gesture, vocabulary.

35B. Dance Composition (2) II. Bolden

Laboratory—5 hours. Prerequisite: course 35A or consent of instructor. To learn the elements of dance production as it applies to the use of lighting, costume design, selection of music, and building of stage props.

35C. Dance Composition (2) III. Bolden

Laboratory—5 hours. Prerequisite: courses 35A, 35B, or consent of instructor. To encourage the student to create new dance forms and prepare them for a 4-7 minute presentation in a spring concert on stage. Costumes and lighting will be created and correlated for each dance by the choreographer.

36A-36B. History of Dance (3-3) I-II. 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. 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)

Internship—6-15 hours; written project proposal and evaluation. Prerequisite: consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work experience in the application of physical activity programs to teaching, recreational, clinical or research situations under department faculty supervision. May be repeated for credit once but no Internship units will be counted toward Physical Education major. (P/NP grading only.)

97T. Tutoring in Physical Education (1-5) I, II, III.

The Staff (Chairperson in charge)
Tutorial—1-5 hours. Prerequisite: lower division standing and consent of Department Chairperson. Tutoring of students in lower division physical activity courses. Weekly meetings with instructor in charge

of courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Field Experience in Teaching Physical Education (2) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; field work—4 hours. Prerequisite: upper division standing and appropriate course 1 or 7. Tutoring or teacher's aide in physical education activities, including athletic coaching, in public schools under the guidance of a regular teacher with supervision by a departmental faculty person. May be repeated once for credit. (P/NP grading only.)

101. Physiological Regulation During Exercise (3) I. Molé, _____

Lecture—3 hours. Prerequisite: Biological Sciences 1A; Physiology 110. Review of physiological mechanisms underlying acute exercise response. Focus is on physiological regulation and control in response to metabolic demand. Metabolism, fluid composition, acid-base, and temperature regulation are studied in relation to control by the cardiovascular, respiratory, and renal systems.

101L. Exercise Physiology Laboratory (1)

Bernauer, Mole

Laboratory—3 hours (for 5 weeks); discussion—2.5 hours (for 5 weeks). Prerequisite: course 101 (may be taken concurrently), Biological Sciences 1A, Physiology 110. Series of laboratory experiments demonstrating the principles of physiological regulation to standardized exercise regimens. The assessment of physiological, environmental and anthropological factors limiting exercise capacities performed on quantitatively controlled ergometric devices, while monitoring physiological variables by noninvasive methods.

102. Physiological Adaptations to Exercise (2) II. Adams, _____

Lecture—2 hours. Prerequisite: course 101 or consent of instructor. Study of physiological capacities with reference to genotypic and adaptive aspects. Analysis of physiological adaptations to chronic physical activity and selected environmental stressors.

103. Analysis of Human Movement (4) III. K.

Williams

Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: Cell Biology and Human Anatomy 101 and Physics 1A; Physics 5A recommended. Anatomical and mechanical fundamentals of human motion. Qualitative and quantitative application of kinesiological principles to a variety of movement situations.

104. Introduction to Motor Control and Skill

Acquisition (3) I. Jennings

Lecture—2 hours; discussion—1 hour to alternate weekly with laboratory—3 hours. Prerequisite: upper division standing; Psychology 1 or 15, and course 45. Analysis of variables affecting the ability to produce, learn, and retain movement skills. Basic neurophysiological and behavioral accounts of motor control processes are examined. Theories of movement retention and motor learning are covered.

105. Psychosocial Factors in Motor Performance

(3) I, II. Jennings

Lecture—3 hours. Prerequisite: Psychology 1, 15, or 16. Survey of theories and experimental findings from social psychology and human motivation and their application to motor performance, including sex differences, success and failure, expectations, anxiety, competition, and aggression.

110. Exercise Metabolism (3) II. Molé

Lecture—2 hours; laboratory—five 4-hour sessions. Prerequisite: courses 101, 102; Chemistry 1A. Focus on energy metabolic pathways and fuels used dur-

ing 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 1A, Cell Biology and 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 Workplace (3) III.

Lecture—2 hours; discussion—1 hour. Explores principles and practices of health promotion in the workplace. Established assessment procedures including validation of job standards are presented. Cost and health benefits are examined with respect to onsite and offsite programs of fitness maintenance and remediation.

120. Sports in American Society (4) I. Gill

Lecture—3 hours; discussion—1 hour. Historical development of sport in American society. Relationship and interaction of sport and politics, economics, religion, art, sexism, racism, and education; current trends and problems.

121. Sports Psychology (4) III. Jennings

Lecture—3 hours; discussion—1 hour. Prerequisite: course 105 and Psychology 145. Consideration of major theories, research findings and methods of data collection in sport psychology through a critical examination of relevant experimental, clinical, and field data.

122. Psychological Effects of Physical Activity (3) II. Jennings

Lecture—3 hours. Prerequisite: Psychology 1 or 15, and upper division standing. Physical activity is evaluated in terms of its ability to enhance the quality of life. Topics studied include: individual factors (self concept, type A); special populations (elderly, car-

diovascular); 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—1/2 hour. Prerequisite: basic Scuba Certification from approved agency (course 29 or the equivalent); 10 logged open-water dives since certification; consent of instructor. Lectures in diver rescue, and resuscitation, navigation, search and light salvage, night diving, research methods, work performance under water, cold-water diving, blue-water diving. Introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

128B. Research Diving: 65 Feet (2) III. 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, cold-water diving, blue-water diving, introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

131. Physical Education for the Handicapped (4) II. Vochatzar

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 103 and consent of instructor. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals.

132. First Aid Leadership and Accident Management (3) I, II, III. _____

Lecture—2 hours; students assist in teaching course 5—1 hour to be arranged. Prerequisite: course 5 or American Red Cross Advanced First Aid Card. Administration, organization and supervision of safety and first aid programs in school and community sports, recreation and all types of group activities. The study and practice of first aid leadership skills. (The American Red Cross First Aid Instructor Card will be awarded upon successful completion of the course.)

133. Prevention and Care of Sports Injuries (3) II, III. _____

Lecture—1 hour; laboratory—6 hours. Prerequisite: upper division standing; Cell Biology and Human Anatomy 101 (may be taken concurrently). Management of the prevention, care, and rehabilitation of injuries incurred by athletes. Laboratory on anatomy, emergency care, physical therapy methods, and taping techniques.

135. Advanced Procedures in Evaluation and

Management of Athletic Injuries (4) I. The Staff (Chairperson in charge)

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 133, Cell Biology and Human Anatomy 101, and consent of instructor. Advanced study of athletic injuries, their evaluation and management, with laboratory work in biomechanics and pathophysiology. In-depth study of selected current topics in athletic training.

142. Physical Education in the Public Schools (3) II. Piper

Lecture—3 hours. Analysis and study of the principles and methods basic to teaching physical education at the elementary and secondary levels.

143A. Coaching Effectiveness (2) I. Singleton

Lecture—2 hours. Prerequisite: consent of instructor. Synthesis and application of basic components of sport psychology, sport pedagogy, and sport physiology to coaching. (P/NP grading only.)

143B. Coaching Effectiveness (2) II. Singleton
Lecture—2 hours. Prerequisite: course 143A. Application of general principles of management and administration to athletic coaching in high school. (P/NP grading only.)

144. Principles of Health Education (2) I, II. 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. ———

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 workshops, testing sessions, and completing final reports. May be repeated once for credit. (P/NP grading only.)

147L. Adult Fitness Training Laboratory (1) I, II, III. 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)

Internship—6-36 hours; written project proposal and evaluation. Prerequisite: upper division standing and consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work experience in the application of physical activity programs to teaching, recreational, clinical or research situations under

department faculty supervision. May be repeated for credit for total of 12 units (including course 92), but no internship units will be counted toward Physical Education major. (P/NP grading only.)

197T. Tutoring in Physical Education (1-5) I, II, III. The Staff (Chairperson in charge)

Tutorial—1-5 hours. Prerequisite: consent of chairperson. Tutoring of students in lower division physical activity courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and Department Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of Department Chairperson. (P/NP grading only.)

Graduate Courses

200A. Introduction to Research: History and Philosophy in Physical Education (2) I. Molé, ———

Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. Fundamental tenets of science and their application to current research in human performance; benchmark studies in the evolution of the field.

200B. Problem Solving and Research Design in Physical Education (2) III. 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. ———

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 alternate years.

***221. Anthropometry in Physical Activity** (3) III. Adams

Lecture—2 hours; laboratory—five 3-hour sessions to alternate weekly with five 1-hour discussion sessions. Prerequisite: courses 101 and 102. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance, and of body structural and compositional changes accompanying prolonged, systematic physical conditioning. Offered in alternate years.

222. Metabolic Functions in Exercise (4) III. Molé

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 102, 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.

Seminar—2 hours. Prerequisite: graduate standing. Review and critical discussion of current research topics concerned with the physiological aspects of physical training and adaptation. Offered in alternate years.

224. Exercise Electrocardiography (2) I. Holly

Lecture—2 hours. Prerequisite: course 112 or consent of instructor. Physiological bases and clinical

implications of normal and abnormal exercise electrocardiograms (ECG) are treated in detail. Exercise prescription is considered as is the predictive significance of normal and abnormal ECG.

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) II. K. Williams

Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor; course 115 recommended. Experimental techniques for biomechanical analysis of human movement are examined. Techniques evaluated include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional cinematography, data reduction and smoothing, body segment parameter determination, electromyography, and biomechanical modeling. (Same course as Biomedical Engineering 227.)

***230. Human Performance: Psychological Aspects** (3) II. ———

Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Critical review of current literature on learning with emphasis on social learning theory and its application to clinical problems related to exercise and sport.

232. Health Psychology: Effects of Physical Activity (3) I. Jennings

Seminar—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of research on the role of physical activity in developing, maintaining, or changing personality and affective states. Special attention will be paid to the potential effect of exercise on mental health.

290. Seminar in Physical Education (1) II. The Staff (——— in charge)

Seminar—1 hour. Prerequisite: graduate standing; required of all first year students for first two quarters. Presentation and discussion of topics of interest, and the analysis of research in physical education. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing; consent of instructor and Department Chairperson. (S/U grading only.)

Professional Courses

300. The Elementary Physical Education Program (2) I. Goldbar

Lecture—1 hour; laboratory—2 hours; field trips to selected programs. Prerequisite: senior standing or credential student. Introduction to principles, theories, material, and practices of elementary school physical education program.

380. Methods of Teaching Physical Education (3) III. Goldbar

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 142 and six units of course 7; or consent of instructor. The methods of teaching group and individual activities for grades K-12; program planning, class management, organization, and evaluation. (P/NP grading only.)

Physical Medicine and Rehabilitation

See Medicine, School of

Physics

(College of Letters and Science)

_____, Chairperson of the Department

Wendell H. Potter, Ph.D., Vice Chairperson of the Department

Department Office, 225 Physics-Geology Building (916-752-1500)

Faculty

Robert H. Becker, Ph.D., Professor
 Franklin P. Brady, Ph.D., Professor
 Thomas A. Cahill, Ph.D., Professor
 Steven Carlip, Ph.D. Assistant Professor
 Ling-Lie Chau, Ph.D., Professor
 Lawrence B. Coleman, Ph.D., Associate Professor
 Linton R. Corruccini, Ph.D., Professor
 James E. Draper, Ph.D., Professor
 Glen W. Erickson, Ph.D., Professor
 Charles S. Fadley, Ph.D., Professor
 Ching-Yao Fong, Ph.D., Professor
 Claude Garrod, Ph.D., Professor
 John F. Gunion, Ph.D., Professor
 James P. Hurley, Ph.D., Professor Emeritus
 John A. Jungerman, Ph.D., Professor Emeritus
 Joseph E. Kiskis, Ph.D., Professor
 William J. Knox, Ph.D., Professor Emeritus
 Winston T. Ko, Ph.D., Professor
 Richard L. Lander, Ph.D., Professor
 Sudhindra Mani, Ph.D., Assistant Professor
 Douglas W. McColm, Ph.D., Associate Professor
 Neal Peek, Ph.D., Senior Lecturer Emeritus
 David E. Pellett, Ph.D., Professor
 Wendell H. Potter, Ph.D., Associate Professor
 Roderick V. Reid, Jr., Ph.D., Associate Professor
 Richard T. Scalettar, Ph.D., Assistant Professor
 Robert N. Shelton, Ph.D., Professor
 Rajiv R.P. Singh, Ph.D., Assistant Professor
 William W. True, Ph.D., Professor Emeritus
 David J. Webb, Ph.D., Assistant Professor
 Phillip M. Yager, Ph.D., Professor
 Xiangdong Zhu, Ph.D., Assistant Professor
 Gergely Zimanyi, Ph.D., Assistant Professor

The Major Program

From the smallest subatomic particles to atoms, molecules, stars, and galaxies, the study of physics is the study of what makes the universe tick. Information learned from high-energy particle accelerators and nuclear reactors teaches us not only what holds the nucleus and the atom together but also why stars shine and how radiation therapy fights cancer.

The Program. The Department of Physics offers three degree programs: the Bachelor of Arts in Physics, and the Bachelor of Science in Physics and in Applied Physics. The A.B. degree provides a broad coverage of classical and modern physics while permitting a broader liberal arts education than is possible with the other two programs. The B.S. degree in either Physics or Applied Physics should be followed by the student who plans to enter physics as a profession. The B.S. in Applied Physics provides the student with a solid introduction to a particular applied physics specialty. For the student who plans to enter the job market on completing a B.S. degree, the applied physics orientation would be an asset. Either B.S. program provides a solid foundation in physics for the student interested in graduate work in either pure or applied physics.

Career Alternatives. Careers in physics and applied

physics include research and development, either in universities, government laboratories, or industry; teaching in high schools, junior colleges, and universities; management and administration in industrial laboratories and in government agencies; and in production and sales in industry. A major in physics also provides a strong base for graduate-level work in such interdisciplinary areas as chemical physics, biophysics and medical physics, geophysics and environmental physics, astrophysics and astronomy, computer science, and materials science.

Applied Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	55
Physics 9A, 9B, 9C, 9D	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, 105AL, 105B, 110A, 110B, 112A, 115A, 116A, 116B, 122A or 122B	36
At least 18 units from approved courses within one of the following concentrations chosen in consultation with a major adviser	
Materials science, physical electronics, quantum optics, energy, chemical physics, atmospheric physics, geophysics, physical oceanography. (Lists of approved courses in each concentration with representative programs are available from the Physics Department.)	18
Total Units for the Major	109

Physics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	40
Physics 9A, 9B, 9C, 9D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Engineering 5 (or equivalent programming course)	3
Depth Subject Matter	39
Physics 104A, 104B, 105A, 105AL, 105B, 110A, 110B, 112A, 115A, 122A or 122B	28
At least 7 units from Physics 105BL, 105C, 110C, 112B, 115B, 127, 129A, 129B, 130A, 130B, 140A, 140B	
At least 4 additional upper division units in physics	4
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 9A, 9B, 9C, 9D	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, 105AL, 105B, 110A, 110B, 110C, 112A, 115A, 115B, 122A or 122B	34

*Course not offered this academic year.

At least 10 units from Physics 105BL, 105C, 112B, 127, 129A, 129B, 130A, 130B, 140A, 140B

At least 10 additional upper division units from physics. (No more than 6 units in courses numbered 194H, 195, 198, and 199 may be applied in satisfaction of this requirement.)

Total 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 108, 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 137, 160).

Program Variance. Courses from other departments may be submitted for courses in the depth subject matter requirements by obtaining written permission from the Undergraduate Curriculum Committee chairperson, as approved by the Department.

Major Advisers. Contact Departmental Undergraduate Majors Office, 231 Physics-Geology Building, for adviser assignment.

Minor Program Requirements:

Three distinct minors are offered, all requiring prerequisites equivalent to Mathematics 21A-21B-21C and 22A-22B-22C and Physics 9A-9B-9C-9D. 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.

Physics

Classical Physics emphasis

Physics 104A-104B, 105A, 105AL, 105C, 108, 108L, 110A-110B

(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.)

Quantum Physics emphasis

Physics 104A-104B, 112A, 105A, 105AL, 105B, 115A-115B

(Physics 104A-104B and 105A-105B must precede 115A-115B. Physics 110A recommended.)

General Physics emphasis

Physics 104A-104B, 105A, 105AL, 105B, 110A, 112A, 115A

(Physics 104A-104B and 105A-105B must precede 115A.)

Graduate Study. The Department of Physics offers programs of study and research leading to the M.S. and Ph.D. degrees and the Ph.D. degree with an Applied Physics Research Specialty. Further information regarding requirements for these three degrees, graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, University of California, Davis 95616.

Astronomy. There is no major program leading to a degree in Astronomy. Introductory courses are offered in general astronomy and astrophysics. Students who wish to use the observatory or the portable telescopes may do so through the Astronomy Club. The graduate program in physics provides research opportunities in radio-astronomy or microwave astrophysics.

Courses in Astronomy

Lower Division Courses

2. Introduction to Modern Astronomy and Astrophysics (4) I. The Staff

Lecture—3 hours; laboratory-discussion—2 hours. Prerequisite: good facility in high school physics and mathematics (algebra and trigonometry). Description and interpretation of astronomical phenomena using the laws of modern physics. Modern astronomical instrumentation. Gravitation, relativity, electromagnetic radiation, atomic and nuclear processes in relation to the structure and evolution of stars, the solar system, galaxies, and the Universe. Not open to students who have received credit for course 10.

10. General Astronomy (4) III. The Staff

Lecture—3 hours; laboratory-discussion—2 hours. A non-mathematical description of modern astronomy with emphasis on the structure and evolution of stars, galaxies, and the Universe. The Sun and the solar system. Optional topics include pulsars, black holes, quasars, and extra-terrestrial communications. Not open to students who have received credit for course 2 or any physics course (except 10, 137, 160). General Education credit: Nature and Environment/Introductory.

Courses in Physics

Physics 10 is primarily a concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 1 is a two-quarter sequence requiring some mathematics (trigonometry). Either 1A alone or both quarters may be taken. The sequence is not intended to satisfy entrance requirements of a year of physics for professional schools, but will satisfy requirements of 3 or 6 units of physics.

Physics 5 is a three-quarter sequence using some calculus (mostly concepts rather than calculations) and including laboratory work as an integral part. The entire sequence is recommended, rather than just 1 or 2 quarters.

Physics 9 is a four-quarter sequence using calculus throughout and including laboratory work as an integral part. The course is designed primarily for students in the physical sciences and engineering.

Note: Faculty listed for each course are well acquainted with the course, but may not teach it this year.

Lower Division Courses

1A. Principles of Physics (3) I. McColem

Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Introduction to general principles and analytical methods used in physics with emphasis on applications in applied agricultural and biological sciences and in physical education. Not open for credit to students who have completed course 5A or 9A (or former 6A or 8A).

1B. Principles of Physics (3) II. McColem

Lecture—3 hours. Prerequisite: course 1A or 5A (or former 6A); and consent of instructor. Continuation of course 1A. Heat, optics, electricity, modern physics. Not open for credit to students who have completed course 5B, 5C, 9B, 9C, or 9D (or former 6B, 6C or 8B, 8C, 8D).

5A. General Physics (4) I, II. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: Mathematics 16B (may be taken concurrently). Mechanics and fluids. Introduction to general principles and analytical methods used in physics. Primarily for biological science majors. Students who have had course 6A or 9A (formerly 8A) may not receive credit for 5A. Those who have had course 1A may receive only 2 units of credit. (Course 5A is former course 6A.) (CAN Phys Seq A)

5B. General Physics (4) II, III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: course 5A (formerly 6A) or 1A with consent of instructor and Mathematics 16B; or Physics 9A (formerly 8A). Continuation of course 5A. Kinetic theory and thermodynamics, wave phenomena, optics. Students who have had course 9B (formerly 8C) or 6C may not receive credit for course 5B. Those who have

had course 1B may receive only three units of credit. (Course 5B is former course 6C.) (CAN Phys Seq A)

5C. General Physics (4) I, III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours. Prerequisite: course 5B (former 6C). Continuation of course 5B. Electricity and magnetism, modern physics. Students who have had course 6B or 9C (former 8B) may not receive credit for course 5C. Those who have had course 1B may receive only three units of credit. (Course 5C is former course 6B.) (CAN Phys Seq A)

6A. General Physics

This course has been replaced by course 5A.

6B. General Physics

This course has been replaced by course 5C.

6C. General Physics (4) I.

Prerequisite: course 6B. Continuation of courses 6A-6B. Effective spring 1991 replaced by course 5B.

8A. Classical Physics

This course has been replaced by course 9A.

8B. Classical Physics

This course has been replaced by course 9C.

8C. Classical Physics

This course has been replaced by course 9B.

8D. Classical Physics

This course has been replaced by course 9D.

9A. Classical Physics (4) III. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: Mathematics 21B. Mechanics. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Only two units of credit allowed for students who have completed course 1A. Only one unit of credit allowed for student who have completed course 5A (formerly 6A). (Course 9A is former course 8A.) (CAN Phys 8)

9B. Classical Physics (4) I. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: course 9A (former 8A) or 5A (former 6A) with consent of instructor; Mathematics 21C; Mathematics 22C (may be taken concurrently). Continuation of course 9A. Fluid mechanics, thermodynamics, wave phenomena, optics. Not open for credit to students who have completed Engineering 105A. Only 1 unit of credit allowed to those who have completed course 5B (former 6C). (Course 9B is former course 8C). (CAN Phys 10)

9C. Classical Physics (4) II. The Staff

Lecture—3 hours; laboratory—2 1/2 hours; discussion—1 hour. Prerequisite: course 9B (former 8C); Mathematics 22B (may be taken concurrently). Continuation of course 9B. Electricity and magnetism including circuits and Maxwell's equations. Only one unit allowed to those who have completed course 5C (former 6B). (Course 9C is former course 8B.) (CAN Phys 12)

9D. Modern Physics (4) III. The Staff

Lecture—3 hours; discussion—1 1/2 hours. Prerequisite: course 9C and Mathematics 22B; Mathematics 22A recommended (may be taken concurrently). Introduction to physics since 1900. Special relativity, quantum mechanics, atoms, molecules, condensed matter, nuclei, particle physics. Only one unit of credit allowed to students who have completed course 5C (or former course 6C). (Course 9D is former course 8D.)

10. Basic Concepts of Physics (4) I, II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra. Survey of basic principles: motion, gravitation, electricity and magnetism, light, relativity, atoms, quanta, nuclei, elementary particles. Includes lecture demonstrations and elementary problem solving. Check with the department office for the emphasis (history/philosophy, energy/environment, natural phenomena, etc.) each quarter. Students who have had any other physics course (except 137, 160) will not receive credit for course 10. General Education credit: Nature and Environment/Introductory.

98. Directed Group Study (1-5) I, II, III. The Staff (Chair person in charge)

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

104A-104B. Introduction to Methods of Mathematical Physics (3-3) I-II. Erickson

Lecture—3 hours. Prerequisite: courses 9B, 9C, 9D, Mathematics 22A, 22B, 22C passed with grade of 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: courses 9B, 9C, 9D, Mathematics 22A, 22B, 22C passed with grade of C- or better, or consent of department. Principles and applications of Newtonian mechanics; introduction to Lagrange's and Hamilton's equations.

105AL. Computational Laboratory in Mechanics (1) I. Ko

Laboratory—3 hours. Prerequisite: Engineering 5 or the equivalent; course 105A concurrently. Introduction to the application of computers to solving physics problems. Introduction to numerical and graphical methods in mechanics. (P/NP grading only.)

105BL. Computational Laboratory in Mechanics (1) II. Ko

Laboratory—3 hours. Prerequisite: course 105AL; course 105B concurrently. Computer application of numerical and graphical methods in mechanics. (P/NP grading only.)

105C. Continuum Mechanics (3) III. Yager

Lecture—3 hours. Prerequisite: courses 104B, 105A. Continuum mechanics.

108. Optics (3) III. Cahill

Lecture—3 hours. Prerequisite: course 9 or 5 sequence and Mathematics 21 sequence or consent of instructor. The phenomena of diffraction, interference, and polarization of light, with applications to current problems in astrophysics, material science, and atmospheric science. Study of modern optical instrumentation. Open to non-majors.

108L. Optics Laboratory (1) III. Cahill

Laboratory—3 hours. Prerequisite: course 108 concurrently. The laboratory will consist of one major project pursued throughout the quarter, based on modern applications of optical techniques.

110A-110B-110C. Electricity and Magnetism (3-3-3) I-II-III. Reid

Lecture—3 hours. Prerequisite: courses 9B, 9C, 9D, Mathematics 22A, 22B, 22C passed with a grade of C- or better; or consent of department. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.

112A-112B. Thermodynamics and Statistical Physics (3-3) I-II. Garrod

Lecture—3 hours. Prerequisite: courses 9A, 9B, 9C, 9D; Mathematics 22C; and course 105B or 115A or the equivalent. Introduction to statistical mechanics and thermodynamics.

115A-115B. Introduction to Quantum Mechanics (3-3) III-I. Fong

Lecture—3 hours. Prerequisite: courses 104B and 105B passed with grade of 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. Pellett
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 9C, Mathematics 22B. An experimental and theoretical study of important electronic circuits commonly used in physics.

116B. Electronic Instrumentation (4) III. Pellett
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 9D, 116A. Continuation of course 116A. Introduction to the use of digital electronics and microcomputers in experimental physics.

121. Foundations of Atomic and Molecular Physics (4) III. McColem

Lecture—3 hours; outside work—9 hours. Prerequisite: course 9D; Mathematics 21C. The phenomena

of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state.

122A. Advanced Physics Laboratory: Atomic/Solid-State (3) I, II. Webb

Laboratory—8 hours. Prerequisite: course 9D. Experimental techniques and measurements in atomic and solid-state physics; e.g., spectroscopy, optical pumping, magnetic resonance, superconductivity, semiconductors, ferroelectricity. The student performs three to six experiments depending on difficulty. Individual work is stressed.

122B. Advanced Physics Laboratory: Nuclear/High Energy (3) I, II. Lander

Laboratory—8 hours. Prerequisite: course 9D. Similar to course 122A with experiments in gamma-ray coincidence, Mossbauer Effect, Rutherford scattering, muon lifetime, others. Student performs three to six experiments; some of these may be chosen from course 122A.

127. Introduction to Astrophysics (3) III. Becker
Lecture—3 hours. Prerequisite: course 105A. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology.

129A. Introduction to Nuclear Physics (3) I. Brady
Lecture—3 hours. Prerequisite: course 115A. Survey of basic nuclear properties and concepts requiring introductory knowledge of quantum mechanics.

129B. Nuclear Physics (4) II. Brady
Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A, Continuation of course 129A.

130A-130B. Elementary Particle Physics (3-4) II-III. Rouse

Lecture—3 hours; term paper required for 130B. Prerequisite: course 115A. Properties and classification of elementary particles and their interactions. Experimental techniques. Conservation laws and symmetries. Strong, electromagnetic, and weak interactions. Introduction to Feynman calculus.

137. Science and Technology of Nuclear Arms Effects and Control (3) I. Jungerman, Craig (Applied Science)

Lecture—3 hours. Prerequisite: upper division standing; one course from courses 1B, 5C, 9D, 10. Scientific and technical aspects of nuclear arms effects and nuclear arms control including nuclear physics of atomic and hydrogen bombs, blast and radiation effects radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Physics 10. (Same course as Applied Science Engineering 137.)

140A. Introduction to Solid-State Physics (3) II. Zhu
Lecture—3 hours. Prerequisite: course 115A or 9D, and consent of instructor. Survey of basic concepts and classification of experimental phenomena in solids. Crystal structure, phonons, simple metals.

140B. Introduction to Solid-State Physics (4) III. Zhu
Lecture—3 hours; outside work—9 hours. Prerequisite: course 140A. Discussions of the following: energy bands and Fermi surfaces, transport phenomena, semiconductors, ferromagnetism, magnetic resonance.

160. Environmental Physics and Society (3) I. Jungerman

Lecture—3 hours. Prerequisite: course 9D or 5C; or course 10 or 1B and Mathematics 16B or the equivalent. Impact of humankind on the environment will be discussed from the point of view of the physical sciences. Calculations based on physical principles will be made, and the resulting policy implications will be considered. (Same course as Engineering 160.) General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Physics 10.

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 18 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 Electromagnetism

(3) I. Scalettar
Lecture—3 hours. Prerequisite: courses 104B, 105B, and 110C or the equivalent; course 204A (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.

200B. Theory of Mechanics and Electromagnetism

(3) II. Scalettar
Lecture—3 hours. Prerequisite: course 200A; course 204B (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 Electromagnetism

(3) III. Yager
Lecture—3 hours. Prerequisite: course 200B. Brief review of static electromagnetic fields; Maxwell's equations; plane waves in various media; magneto-hydrodynamics.

200D. Theory of Mechanics and Electromagnetism

(3) I. Yager
Lecture—3 hours. Prerequisite: course 200C. Diffraction theory. Radiating systems and electron theory.

204A-204B. Methods of Mathematical Physics (3-3) I-II. Chau

Lecture—3 hours. Prerequisite: courses 104A and 104B or the equivalent. Linear vector spaces, operators and their spectral analysis, complete sets of functions, complex variables, functional analysis, Green's functions, calculus of variations, introduction to numerical analysis.

215A. Quantum Mechanics (3) I. The Staff

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. The Staff

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. The Staff

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. Singh

Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics.

219B. Statistical Mechanics (3) II. Singh

Lecture—3 hours. Prerequisite: course 219A. Appli-

cations to properties of solids, real gases, nuclear matter, fluctuations about the equilibrium state.

221. Atomic Physics (3) III. McCole

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 momenta, and electromagnetic transition rates.

224C. Nuclear Physics (3) I. Draper, Brady

Lecture—3 hours. Prerequisite: course 224B. Study of nuclear scattering and reactions including the optical model and direct interactions. Beta decay and an introduction to weak interactions.

229A. Advanced Nuclear Theory (3) II. Brady

Lecture—3 hours. Prerequisite: course 224C. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for two-body scattering. Not offered every year.

229B. Advanced Nuclear Theory (3) III. Brady

Lecture—3 hours. Prerequisite: course 229A. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for three-body scattering. Not offered every year.

230A. Quantum Theory of Fields (3) I. Gunion

Lecture—3 hours. Prerequisite: course 215C. Relativistic quantum mechanics of particles; techniques and applications of second quantization; Feynman diagrams; renormalization.

230B. Quantum Theory of Fields (3) II. Carlip

Lecture—3 hours. Prerequisite: course 230A. Continuation of 230A, with selected advanced topics, such as S-matrix theory, dispersion relations, axiomatic formulations.

239A. Quantum Many-Body Systems (3) II. Singh

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.

240A-240B-240C. Solid-State Physics (3-3-3) II-III-I. Corruccini, Zimanyi

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. Kiskis

Lecture—3 hours. Prerequisite: course 230A. Phenomenology and systematics of strong, electromagnetic, and weak interactions of hadrons and leptons; determination of quantum numbers; quarks and quarkonia; deep inelastic scattering; the quark parton model; experiments at hadron colliders and electron-positron colliders.

245B. High-Energy Physics (3) III. Mani

Lecture—3 hours. Prerequisite: course 245A. Electroweak interactions; phenomenology of the Standard Model of SU(2)_L × U(1); weak interaction experiments; properties of and experiments with W and Z vector bosons; Glashow-Weinberg-Salam model and the Higgs boson; introduction to supersymmetry and other speculations.

245C. High-Energy Physics (3) III. Carlip
Lecture—3 hours. Prerequisite: course 245A. Strong interaction: quantum chromodynamics phenomenology; jets and other experimental tests; quark and gluon distribution functions; quark and gluon scattering; applications of the renormalization group. Not offered every year.

250. Special Topics in Physics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from year to year. May be repeated three times for credit. Not offered every quarter.

252A. Techniques of Experimental Physics (3) III. The Staff

Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from condensed matter will be utilized.

252B. Techniques of Experimental Physics (3) III. Mani

Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from nuclear and particle research will be utilized.

290. Seminar (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 Elementary Particle Physics (1-2) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours. Prerequisite: graduate standing in Physics. Presentation and discussion of any topic of current research interest in experimental or theoretical particle physics. Topics vary weekly. (S/U grading only.)

293. Seminar in Solid-State Physics (1-2) I, II, III. The Staff

Seminar—1-2 hours. (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 speciality and research of the Physics staff. (S/U grading only.)

297. Techniques of Teaching Physics (3) III. Potter

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 (916-752-1373)

Faculty

Arthur L. Black, Ph.D., Professor Emeritus
Michael L. Bruss, D.V.M., Ph.D., Associate Professor
Victor W. Burns, Ph.D., Professor Emeritus
Charles E. Cornelius, D.V.M., Ph.D., Professor Emeritus

Donald L. Curry, Ph.D., Professor
Richard A. Freedland, Ph.D., Professor
Dorothy W. Gietzen, Ph.D., Assistant Professor
Robert J. Hansen, Ph.D., Professor
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
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 alternate years.

***205B. Intermediary Metabolism of Animals (3) II.** Rogers, Hansen, Hershey (Biological Chemistry), Rucker (Nutrition)

Lecture—3 hours. Prerequisite: course 205A or consent of instructor. Pathways and control in animals of the biosynthesis and degradation of amino acids, proteins, nucleotides and porphyrins; includes hormonal, nutritional, and genetic effects. Offered in alternate years.

220. Physiology of the Liver (3) I. Bruss

Lecture—2.6 hours; laboratory—1.2 hours. Prerequisite: systemic physiology; biochemistry or physiological chemistry; or consent of instructor. Topics in functional morphology, physiology, intermediary metabolism, pharmacology, and disorders of the liver. Emphasis on bile formation; bile pigments; bile acids; drug and toxin metabolism; circulation; carbohydrate, lipid and protein metabolism; ion transport; and function tests. Offered in alternate 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 alternate years.

238. Behavioral Adaptations to Parasites and Pathogens (2) II. Hart

Lecture—2 hours. Prerequisite: Veterinary Medicine 406; or graduate standing and upper division course in animal behavior; or consent of instructor. Examination of the ways in which animals use behavioral strategies to avoid debilitating viral, bacterial and parasitic diseases, or to overcome such diseases

once they are sick. Main emphasis is on vertebrates, especially wild and domestic mammals.

243A. Isotopes as Tracers in Biological Research (2) I. Bruss

Lecture—2 hours. Prerequisite: biochemistry or physiological chemistry; elementary calculus and physics; or consent of instructor. Study of the properties of isotopes and their detection with emphasis on biological applications. Offered in alternate years.

243B. Isotopes as Tracers in Biological Research (2) II. Bruss

Lecture—18 hours total; laboratory—2 hours total. Prerequisite: course 243A or consent of instructor. Study of in vivo and in vitro techniques for using isotopes in biological research. Offered in alternate years.

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 alternate 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 alternate 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 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 study of physiology is concerned with understanding the mechanisms that control and carry out the vital functions of living organisms. From the single cell and its parts, through the various organ systems, to the whole animal and its relationship to its environment—the entire range of function of living matter is investigated.

The Program. An understanding of physiology must be built on a broad scientific background. In the freshman and sophomore years, physiology majors take courses in chemistry, biology, physics, and mathematics. As juniors and seniors, majors can enroll in a variety of physiology courses along with upper-division courses in related sciences. With this background, students can participate in a number of advanced laboratory courses or may design an individual, independent project guided by a member of the faculty.

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. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

Career Alternatives. Completion of the physiology major provides the foundation for a challenging career in physiology and also serves as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and other health sciences. Students interested in research and advanced teaching may use the program as preparation for continued study leading to advanced degrees.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	61-70
Biological Sciences 1A, 1B, 1C	15
Chemistry 1A-1B-1C and 5 (or 4A-4B-4C); 8A-8B (or 118A-118B or 128A- 128B)	21-25
Mathematics 16A-16B-16C (or 21A-21B- 21C)	9-12
Physics 5A-5B-5C	12
Statistics 13 (or 102)	4
Depth Subject Matter	27
Physiology Core Requirements:	
Physiology 100A, 100B, 100L	8
Physiology 110, 110L	7
Physiology 111A or 111B or 111C	3
Additional Physiology Depth Unit Require- ments	9
Courses 106A, 106B, 190, 190C, 196A, 196B, 197, 198, 199 may <i>not</i> be used to meet Physiology Depth Requirements.	
Restricted Electives	16
Upper division science units to include:	
a. Biochemistry Requirement: Physiological Sciences 101A-101B or Biochemistry 101A-101B	
b. Morphology Requirement: Cell Biology and Human Anatomy 101, 101L; or Zoology 100-100L or Zoology 122; or Anatomy 100; or Anthropology 155	
Courses 106A, 106B, 190, 190C, 196A, 196B, 197, 198, 199 may <i>not</i> be used for Restricted Electives.	
Breadth Subject Matter Refer to appropriate College section for a description of requirements to be completed in addition to those for the major.	
Total Units for the Major	104-111
Master Adviser. E.E. Carstens.	
Advising Center. 196 Briggs Hall (916-752-9696)	
Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information on graduate study may be obtained by writing the Graduate Adviser, 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 1A. 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 1A. Introductory course in physiology for nonscience majors.

Upper Division Courses

100A. General Physiology (3) I. Horwitz
Lecture—3 hours. Prerequisite: Biological Sciences 1A and Chemistry 8B. Interaction of intracellular compartments in the functioning of animal cells. The metabolic basis and regulation of cellular function. Relation of cell and tissue structure to physiological mechanisms.

100B. General Physiology (3) II. Pappone
Lecture—3 hours. Prerequisite: course 100A; Physics 5C recommended. Continuation of course 100A, with emphasis on transport processes, generation and communication of information between the environment and cells and between cells. Cellular aspects and immune-system function.

100L. General Physiology Laboratory (2) II. Horwitz, Horowitz
Discussion—five 2-hour sessions to alternate weekly with laboratory—five 6-hour sessions. Prerequisite: course 100A; course 100B (concurrently); or consent of instructor. Experiments in the physical and chemical processes of cells and tissues.

106A. Experiments in Physiology: Design and Execution (3) II. 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) III. 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, Fuller, Ishida, Sillman, Weidner
Lecture—5 hours. Prerequisite: Biological Sciences 1A; Physics 1B or 5C recommended. Organ systems. Concepts of integrative and homeostatic mechanisms.

110L. Systemic Physiology Laboratory (2) I.

Adamson; III. Ishida
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. Advanced Systemic Physiology Laboratory (3) I. Adamson

Lecture—1 hour; discussion—five 2-hour sessions to alternate weekly with laboratory—five 6-hour sessions. Prerequisite: courses 110, 110L; courses 113, 114 recommended. Selected comprehensive experiments on the cardiovascular, respiratory, digestive, and endocrine systems. Emphasis on conceptual and methodological approaches using several species in demonstrating the physiology of organ systems.

111B. Advanced Systemic Physiology Laboratory (3) II. Adamson

Lecture—1 hour; discussion—five 2-hour sessions to alternate weekly with laboratory—five 6-hour ses-

sions. Prerequisite: courses 110, 110L; course 112 recommended. Course 111A is not a prerequisite for course 111B. Selected comprehensive experiments on the nervous and muscular systems. Emphasis on conceptual and methodological approaches using several species in demonstrating the physiology of organ systems.

111C. Advanced Systemic Physiology Laboratory (3) III. Adamson

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 110, 110L, Statistics 13; course 112, 113, or 114 recommended. Interfacing physiological recording equipment with microcomputers; data acquisition and analysis using the microcomputer; data interpretation within the framework of physiological concepts.

112. Neuroscience (3) I. Carstens, Horowitz
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) II. Goldberg, Weidner

Lecture—4 hours. Prerequisite: course 110; Chemistry 8B, Physics 5B recommended. An intense and advanced presentation of concepts in cardiovascular, respiratory, and renal physiology including discussion of acid-base balance. Recommended for Physiology students, graduate students, and others in allied interests.

***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.

Lecture—3 hours. Prerequisite: course 110 or Biological Sciences 1B. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and endocrine system.

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.

120D. Comparative Physiology: Endocrinology (3) II. Barkley

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.** Cech

Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: respiration. Offered in alternate 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 alternate years.

148. Principles of Environmental Physiology (3) II. Fuller

Lecture—3 hours. Prerequisite: courses 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 Biological Sciences 1B. 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)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in physiology. (P/NP grading only.)

194HA-194HB-194HC. Physiology—Honors (1.1-4.2) I, II, III.

Laboratory—3-12 hours. Prerequisite: senior standing; minimum 3.5 GPA; approval by the departmental Honors Committee. Honors project in physiology. Laboratory research in physiology on a specific question. Project developed with a sponsoring faculty member (Physiology Graduate Group member) and approved by the departmental Honors Committee. Honors thesis submitted upon completion of the project. (P/NP grading only.)

196A. Voluntary Control of Physiological Processes (2) II, III. Lorenz

Seminar—1 hour; laboratory—3 hours. Prerequisite: adequate upper division preparation in at least one of the following: physiology, behavioral science, computer science, physics or electrical engineering; consent of instructor. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. (P/NP grading only.)

196B. Voluntary Control of Physiological Processes (1-4) I, II, III. Lorenz

Laboratory—3-12 hours. Prerequisite: course 196A. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. May be repeated for credit with a maximum of 6 units for 196A-196B course sequence. (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. Animal Cell Culture 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. Techniques of cell culture, with emphases on cell physiology and the actions of drugs and toxicants on cultured somatic cells. Design, performance and interpretation of experiments with animal cells in vitro.

213. Principles of Electronics for Biologists (2) III. Horowitz, Scobey

Lecture—1 hour; laboratory—3 hours. Prerequisite: Physics 5A, 5B, 5C, and Mathematics 16A, 16B, 16C or the equivalent. Principles of electronics applied to biological measurements. Focuses on interconnection of laboratory instruments including filters and computers. Topics covered include: RC networks; operational amplifiers; digital gates; computer interfacing; and programming.

214. Neurophysiology (4) II. Carstens

Lecture—4 hours. Prerequisite: courses 111B, 112; consent of instructor. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity.

215. Neurophysiology Laboratory (3) III. Horowitz, Scobey

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 alternate 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 alternate years.

***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 alternate years.

220. General and Comparative Physiology of Reproduction (3) I. Anderson (Animal Science), Stabenfeldt (Reproduction), Lasley (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.

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 (3) II. Woolley

Lecture—3 hours. Prerequisite: course 110 or the equivalent course in systemic physiology; course 130 or the equivalent course in endocrinology. Neural-endocrine interactions; neural regulation of the endocrine system, especially in relation to reproduction; the role of hormones and growth factors in sexual differentiation of the brain.

234. Neurophysiological Basis of Neurotoxicology (3) I. Woolley

Lecture—3 hours. Prerequisite: course 110 or the equivalent; basic understanding of neurophysiology. Mechanisms of action at the cellular and systemic level of a number of different neurotoxins and toxicants. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Same course as Environmental Toxicology 234.)

242. 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 alternate years.

***275. Neurohumoral Regulatory Mechanisms of Thermogenesis (3)** II. Horowitz, Horowitz

Lecture—2 hours; discussion—1 hour. Prerequisite: course 100A or the equivalent; Biochemistry/Physiological Sciences 101A or the equivalent; consent of instructor. Designed for graduate and advanced undergraduate students, this course will examine thermogenic systems in homeotherms (primarily mammals) with respect to regulation (hormonal and central nervous control) and effector mechanisms (basis of heat generation at the target cell).

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)

290C. Research Conference in Physiology (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in physiology. May be repeated for credit. (S/U grading only.)

291A. Selected Topics in Visual Science (2) III.

Chalupa (Psychology), Johnson (Ophthalmology), Scobey (Neurology), Sillman Seminar—2 hours. Prerequisite: graduate student standing and consent of instructor; course 217 recommended. Vision from the standpoint of physiology, biochemistry, morphology and psychophysics. Consideration of all levels of the visual system from periphery to highest brain centers. Emphasis on recent research. Topics vary each year. May be repeated for credit. (S/U grading only.)

291B. Seminar in Cellular Mechanisms of Adaptation (1) II, III. Horowitz

Discussion—0.5 hour; seminar—0.5 hour. Prerequisite: course 100B; Biochemistry 101B or Physiological Sciences 101B; consent of instructor. Review and evaluation of current literature and research in cellular adaptations to the environment. May be repeated for credit when a different topic is studied. (S/U grading only.)

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.)

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)

Charles A. Fuller, Ph.D., Chairperson of the Group
Group Office, 196 Briggs Hall (916-752-9696)

Faculty. Consists of more than 70 faculty members drawn from 23 departments in the College of Agriculture and Environmental Sciences, the College of Letters and Science, the School of Medicine, and the School of Veterinary Medicine.

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. The programs emphasize broad training in the fundamental principles of physiology and in-depth specialization in cardiorespiratory, cellular, comparative, endocrine, reproductive, exercise, metabolic, neuro-, systemic and domestic animal physiology. For information regarding these programs, address the Program Staff Person at the above location.

Graduate Advisers. J.M. Horowitz (*Animal Physiology*), J.H. Jones (*Physiological Sciences*), and T. Adams (*Animal Science*).

Graduate Admissions Officer. B.A. Horwitz (*Animal Physiology*)

Plant Biology (A Graduate Group)

Fred Bliss, Ph.D., Chairperson of the Group

Group Office, 152 Robbins Hall (916-752-7094/FAX 916-752-4754)

Faculty. Includes 108 faculty members from 13 departments in the field of plant biology.

Graduate Study. The Graduate Group in Plant Biology offers programs of study and research leading to the M.S. and Ph.D. degrees. The program is designed to prepare students for careers in teaching and research at colleges and universities, government or industrial laboratories. The graduate curriculum involves both a broad overview of the discipline and in-depth study and research in one of four areas of specialization: cell and molecular biology; ecology, systematics, and evolution; integrative plant and crop physiology; and plant development and structure. These areas of specialization permit individual study and research into diverse aspects of plant biology, including anatomy, biochemistry, cell biology, cytology, developmental biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, phycology, physiology, systematics, and weed science.

Preparation. For both the M.S. and Ph.D. programs, a level of scholastic development equivalent to a Bachelor's degree in biological sciences from a recognized college or university is required. Courses in the following areas are considered to be prerequisite to the advanced degrees in Plant Biology: inorganic chemistry, organic chemistry, introductory physics, genetics, structural botany, biochemistry, introductory plant physiology, introductory plant physiology laboratory, calculus, introductory statistics, and evolutionary biology. Limited deficiencies can be made up after admission. The graduate adviser, the major professor, and the student will design a program of advanced courses to meet individual academic needs within one of the specializations.

Graduate Adviser. Contact the Group office.

Courses in Plant Biology

Graduate Courses**201. Plant Senescence: Cellular and Molecular Aspects (4) II.** Romani in charge

Lecture—4 hours. Prerequisite: Botany 111, 112; Biochemistry 101A-101B. Cellular and molecular phenomena associated with the senescence of plants and plant parts. Emphasis on principles and mechanisms. Offered in alternate years.

202. Advanced Physiology of Cultivated Plants (2) I. Sachs (Environmental Horticulture), Labavitch (Pomology)

Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101 and 102; Botany 111, 112. Selected physiological topics generally focusing on source-sink behavior affecting crop production and quality. (P/NP grading only.) Offered in alternate years.

208. Plant Hormones and Regulators (3) II. Labavitch (Pomology), Yang (Vegetable Crops)

Lecture—3 hours. Prerequisite: Botany 112. Chemistry, biochemistry and physiological activity of major classes of natural plant growth regulators. Primary consideration given to concepts that are of current research interest. Uses of growth regulators in agriculture. Offered in alternate years.

214. Higher Plant Cell Walls (3) I. Labavitch (Pomology), Nevins (Vegetable Crops)

Lecture—2 hours; discussion—1 hour. Prerequisite: Botany 112, a course in biochemistry. Lectures focus on the structure, analysis, synthesis, and development-related metabolism of cell walls. Discussions center on analysis of scientific papers related to lecture topics. Offered in alternate years.

216. Advanced Topics in Mineral Nutrition (4) III.

Läuchli (Land, Air and Water Resources)

Lecture—3 hours; discussion—1 hour. Prerequisite:

course 135 or consent of instructor. Cellular compartmentation of mineral elements, new methods and results; selected topics in absorption, translocation, metabolism and function of mineral elements; nutrition and transport in plants adapted to special nutrient environments. Offered in alternate years.

217. Membrane Biology of Plants (3) III. Bennett (Vegetable Crops)

Lecture—2 hours; discussion—1 hour. Prerequisite: Botany 112 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 alternate years.

220. Plant Developmental Biology (4) III. Rost, Jernstedt, Silk

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: plant anatomy, physiology, and biochemistry. A survey of the concepts of plant development and organization. Examines plant cells, tissues, and organs with special emphasis on experimental evidence for mechanisms regulating developmental processes.

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 in 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 Pathology

(College of Agricultural and Environmental Sciences)

John M. Duniway, Ph.D., Chairperson of the Department

Department Office, 354 Hutchison Hall
(916-752-0300)

Faculty

Richard M. Bostock, Ph.D., Associate Professor
George Bruening, Ph.D., Professor
Edward E. Butler, Ph.D., Professor Emeritus
Robert N. Campbell, Ph.D., Professor
Michael R. Davis, Ph.D., Lecturer
James E. DeVay, Ph.D., Professor Emeritus
John M. Duniway, Ph.D., Professor
W. Harley English, Ph.D., Professor Emeritus
Bryce W. Falk, Ph.D., Associate Professor
Robert L. Gilbertson, Ph.D., Assistant Professor
David G. Gilchrist, Ph.D., Professor
Deborah A. Golino, 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 Emeritus
Bret M. Tyler, Ph.D., Associate Professor
Jerry K. Uyemoto, Ph.D., Lecturer
Ariana H.C. van Bruggen, Ph.D., 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. B. Kirkpatrick, J.J. Marois, B.M. Tyler, A.H.C. van Bruggen, .

Courses in Plant Pathology

Upper Division Courses

120. Introduction to Plant Pathology (4) I. Gilbertson; III. Campbell
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1C; Microbiology 2 recommended. The nature, cause, and control of plant diseases.

125. Diagnosis and Control of Plant Diseases (4) III. MacDonald
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 120. Clinical plant pathology with emphasis on diagnosis, epidemiology, and control of diseases of economic plants. Students may specialize in diseases of fruits, vegetables, field crops, or ornamentals in the laboratory exercises. Offered in alternate years.

130. Physiology of Fungi (3) I. Gilchrist, Bostock
Lecture—3 hours. Prerequisite: Biological Sciences 1C; 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 alternate years.

140. Agricultural Biotechnology, Ethics and Public Policy (4) III. Marois
Lecture—3 hours; term paper or discussion—1 hour. Examination of agricultural biotechnology within a moral/ethical framework. Public policy development and implementation. General Education credit: Nature and Environment/Non-Introductory.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: course 120 and consent of instructor. Work experience off and on campus, supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

205A-205B. Diseases of Vegetable and Field Crops (3-1) III-Extra-session summer. van Bruggen
Lecture—1 hour; laboratory—2 hours; fieldwork—8 hours (Summer Session consists of one 4-5 day field trip only). Prerequisite: course 120; Botany 119. Study of vegetable and field crops diseases with emphasis on recognition and diagnosis, epidemiology, and control. (Deferred grading only, pending completion of sequence.) Course 206A-206B may be taken concurrently.

206A-206B. Diseases of Fruit, Nut, and Vine Crops (3-1) III-Extra-session summer. Kirkpatrick
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 120; 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 sequence.) Course 205 may be taken concurrently.

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease (4) II. Duniway
Lecture—3 hours; discussion—1 hour. Prerequisite: course 120 or the equivalent. Interaction between higher plants, plant pathogens, and the environment which is important in the occurrence and severity of plant disease. Emphasis is placed on the population dynamics and ecology of plant pathogens in the aerial and soil environment. Offered in alternate years.

***209. Principles of Plant Disease Control** (3) II. 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 alternate years.

210. Physiology and Biochemistry of Host-Pathogen Interaction (4) I. Gilchrist, Bostock
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or the equivalent; 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 alternate years.

215X. Genetics and Molecular Biology of Plant Pathogens (4) II. Tyler
Lecture—3 hours; laboratory/discussion—3 hours. Prerequisite: course 120 and Genetics 100. Genetic analysis of pathogenicity, cultivar-specificity, and host-specificity in plant pathogens, particularly fungi; application of molecular biology to the isolation and characterization of the genes involved; and to aspects of pathogen identification; emphasis on research techniques and problem-solving. Offered in alternate years.

217. Molecular Genetics of Fungi (3) II. Holland, Tyler
Lecture—3 hours. Prerequisite: graduate standing in a biological science; Biochemistry 101B; Genetics 100, 102A; Botany 119; courses 130, 215X; Microbiology 215 recommended. Advanced treatment of molecular biology and genetics of filamentous fungi and yeasts, including gene structure, organization and regulation; plant pathogenesis; secretion; control of reproduction; molecular evolution; transformation; and gene manipulation. (Same course as Biological Chemistry 217.) Offered in alternate years.

224. Pathogenic Fungi (5) III. The Staff
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. Offered in alternate years.

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, III. The Staff (Chairperson in charge)
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as 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 Plant Biology (A Graduate Group) for graduate study.

Plant Physiology (A Graduate Group)

Students admitted into the Plant Physiology Graduate Group before June 30, 1989 will be allowed to complete their degree in this subject.

New students, however, should see the Plant Biology Graduate Group section in this catalog.

Information. 152 Robbins Hall (916-752-7094)

Plant Protection and Pest Management (A Graduate Group)

Bruce Jaffee, Ph.D., Chairperson of the Group
Group Office, 367 Briggs Hall (916-752-0475)

Faculty. Includes faculty members from the Colleges of Agricultural and Environmental Sciences, and Letters and Science.

Graduate Study. The Graduate Group in Plant Protection and Pest Management offers programs of study and research leading to the M.S. degree. Students may conduct independent research or participate in on-going projects on integrated crop management and sustainable agriculture. Weeds, insects, plant pathogens, nematodes, rodents, and other pests are treated as parts of complex ecosystems and not as isolated problems. Courses include: concepts and systems of plant protection and pest management; diagnosis and control of plant pest problems; toxicology and legal ramifications; and equipment for chemical applications. Detailed information can be obtained from the Group Chairperson and the *Graduate Announcement*.

Graduate Adviser. R.F. Norris (*Botany*), M. Parrella (*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. Prerequisite: Agricultural Science and Management 150, Entomology 110, Plant Pathology 120, Botany 120 (may be taken concurrently), Nematology 100; Botany 117 or Zoology 125 recommended. Eco-

logical 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. Rosenheim (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 plant science major trains students in the biological and natural sciences as they apply to the production, protection, and maintenance of crop plants, and their quality following harvest.

The Program. Students majoring in plant science spend the first two years of study developing the scientific and general background necessary for upper-division work. The science courses include chemistry, biology, botany, physics, and mathematics. General background is provided by course offerings in the social science/humanities area (English, rhetoric, and economics) and by courses in areas supportive of plant science, such as entomology (the study of insects), weed science, genetics, water science, plant pathology (plant diseases), and plant physiology (plant processes and functions). At the upper division level, students may choose to specialize in one of the seven departmentally associated options or may choose general education by electing the general Plant Science option.

Internships and Career Alternatives. Internships are available with local seed companies in farm production, and in extension work with farm advisers. For graduates, job opportunities exist in nursery and greenhouse management, farming, technical, and sales positions in agricultural businesses and associated enterprises, such as banking and equipment and supply companies, as well as in private, state, and federal service in consulting and research.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses may be taken with your adviser's approval. Courses shown without parentheses are required.)

UNITS

English Composition Requirement3-11

See College requirement0-8

Additional English (English 102 in plant science or related area, or English

104).....	1-3
Preparatory Subject Matter	59-61
Computer science (Agricultural Science and Management 21).....	3
Economics (Economics 1A or 1B).....	5
Physics (Physics 1A-1B).....	6
General chemistry (Chemistry 1A-1B).....	10
Organic chemistry (Chemistry 8A-8B).....	6
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Plant science (Plant Science 2).....	5
Mathematics (Mathematics 16A-16B).....	6
Depth Subject Matter	36-37
Statistics (Agricultural Science and Management 150).....	4
Soil science (Soil Science 100).....	4
Weed science (Botany 120).....	3
Entomology (Entomology 110 or 115).....	4
Plant pathology (Plant Pathology 120).....	4
Plant physiology (Botany 111, 112).....	6
Genetics (Genetics 100).....	4
Water science (Water Science 104 or 110).....	3-4
Plant nutrition (Botany/Plant Science 135 or Soil Science 109).....	4
Select one of the following eight options	38-49
Agronomy Option	
Specific course requirements	20-21
Agronomy 100, 100L.....	5
Agronomy 111, 112, 113 (any two courses).....	7-8
Plant Science 101.....	4
Soil Science 109.....	4
Additional courses to be selected with consent of the adviser from the following.....	24-25
Agricultural Economics 130, 140, 150; Agricultural Engineering Technology 103, 104AT, 105; Agricultural Practices 49, 149; Animal Science 2, 114, 116; Atmospheric Science 105; Nematology 100, 110; Plant Pathology 125; Plant Science 102, 103, 113; Soil Science 102, 120, 150; Water Science 103, 110, 172.	
Courses offered in other production departments (e.g., Vegetable Crops, Pomology, Viticulture and Enology, etc.) or in Range Science may be selected in consultation with adviser to satisfy specific individual goals.	
Natural sciences electives, not to exceed 8 units, may also be included.	
Floriculture/Nursery Management Option	
Specific course requirements	27
Environmental Horticulture 6, 105, 120, 125, 133.....	19
Plant Science 102, 109.....	8
Additional courses to be selected with consent of the adviser from the following...18	
Agricultural Economics 18, 112, 113; Agricultural Engineering Technology 114; Agronomy 100; Botany 105, 111L; Economics 11A, 11B; Environmental Horticulture 107, 130; Geography 3; Landscape Architecture 40, 131, 155; Microbiology 3; Plant Pathology 125; Plant Science 101, 112, 112L, 113; Pomology 102; Psychology 144; Soil Science 109; Vegetable Crops 101; Viticulture and Enology 101B, 110, 116.	
Courses offered in the natural sciences may be selected in consultation with adviser.	
Landscape Horticulture Option	
Specific course requirements	30
Environmental Horticulture 6, 105, 120, 130, 133.....	17
Landscape Architecture 40, 131, 155.....	9
Plant Science 102.....	4

Additional courses to be selected with consent of the adviser from the following...15
Agricultural Economics 18, 112, Agronomy 100; Botany 105; Economics 11A, 11B; Environmental Horticulture 107, 125; Geography 3; Landscape Architecture 111; Plant Pathology 125; Plant Science 101, 109, 113; Pomology 101; Soil Science 109; Vegetable Crops 101; Wildlife and Fisheries Biology 10.

Courses offered in the natural sciences may be selected in consultation with adviser.

Plant Pathology Option

Specific course requirements

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

Plant science (Plant Science 101, 102, 109, 113, 122).....11

Agricultural economics (Agricultural Economics 18, 113, 120, 130, 140, 150).....3-5

Agronomy (Agronomy 100, 100L).....5

Environmental horticulture (Environmental Horticulture 6, 105, 125, 130).....3-4

Pomology (Pomology 101, 102).....4

Vegetable crops (Vegetable Crops 101).....4

Viticulture (Viticulture 2).....2

Biochemistry (Biochemistry 101A, 101B).....6

Environmental toxicology (Environmental Toxicology 101).....4

Soils (Soil Science 109).....4

Pomology Option
Specific course requirements

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 110, 116; Water Science 110.

Natural sciences electives, not to exceed 8 units, may also be included.

Vegetable Crops Option
Specific course requirements

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, 196, 270; Soil Science 109; Vegetable Crops 118, 195; one unit of seminar to be selected with consent of adviser in subject matter area of specialization; 2 units of 190 or 198 or 9 units of 199 may be applied toward requirement. A Senior Thesis option is available.

Natural sciences electives, not to exceed 8 units, may also be included.

Viticulture Option

Specific course requirements34-35
 Biochemistry 101A, 101B6
 Plant Science 101, 102, 10912
 Viticulture and Enology 2, 101A, 101B,
 101C, 110 or 111, 115 or 116,
 11816-17

Additional courses to be selected with consent of the adviser from the following10-11
 Agricultural Economics 18, 140, 150; Agricultural Engineering Technology 101AT; Agricultural Practices 49, 149; Atmospheric Sciences 105; Biochemistry 122; Nematology 100, 110; Plant Pathology 125; Plant Physiology 208; Plant Science 103, 112, 112L, 113, 122, 202; Soil Science 102, 109, 150; Viticulture and Enology 110, 111, 210, 216, 217, 219; Water Science 103, 110, 172.

Natural sciences electives, not to exceed 8 units, may also be included.

Unrestricted Electives0-30

Total Units for the Major180

Advising Center for the major is located in 137 Hunt Hall (916-752-1715).

Related Courses. See under Agronomy, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, and Viticulture and Enology.

Courses in Plant Science

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center (see above).

Lower Division Courses

2. Production of Cultivated Plants (5) I. Saltveit; III. Rappaport (Vegetable Crops)

Lecture—3 hours; laboratory—6 hours; 2 three-hour field trips required. Prerequisite: high school courses in biology and chemistry recommended. Introduction to and application of principles of plant science to production of cultivated crops; including how yield and quality are affected by breeding, propagation, culture, harvesting, storage, and marketing. Laboratories include demonstrations, discussions, planned experiments, and individual field plot experiments.

10. Plants and People (3) I. The Staff (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 (Agronomy and Range Science) in charge) Internship—3-18 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to plant science. Internships supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Rains (Agronomy and Range Science) in charge) Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Courses

101. Ecology of Crop Systems (4) III. Bloom (Vegetable Crops)

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 112. 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. Offered in alternate years.

104. Conservation of Plant Genetic Resources (4) I. Bliss and McGranahan

Lecture—3 hours; discussion—1 hour. Prerequisite: Genetics 10 or Biological Sciences 10. Biological, social, and ethical issues involved in plant genetic resources will be studied beginning with their historical importance to human welfare and covering germplasm utilization, property rights and strategies for conservation, both on an international and a personal scale.

***107L. Plant Cell, Tissue, and Organ Culture (5) III.** The Staff

Lecture—2 hours and laboratory—6 hours (intensive 5-day session); seminar—1 hour and research projects. Prerequisite: Botany 111, 112 (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 Biological Sciences 1C. 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: general plant science background recommended (e.g., course 2, 10 or Food Science and Technology 2); concurrent enrollment in course 112L recommended. Physiological processes related to the maturation and senescence of fruits, vegetables, and ornamentals; fundamentals involved in handling, transportation, storage, and marketing practices, e.g., temperature and humidity control, protective treatments, controlled atmospheres.

112L. Postharvest Physiology and Handling Laboratory (2) I. 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) I. Jones (Vegetable Crops)

Lecture—3 hours. Prerequisite: Genetics 100; Botany 111, 112; or consent of instructor. Principles and recent advances in the physiological genetics of plants. Plant developmental processes related to yield will be considered at several levels; genetic control, biochemical regulation and the impact of the environment on development of plants. Offered in alternate years.

126. Physiology of Environmental Stresses in Plants (3) II. Lăuchli (Land, Air and Water Resources)

Lecture—2 hours; discussion—1 hour. Prerequisite:

Botany 112 (may be taken concurrently) or the equivalent. Principles and selected topics in physiology of environmental stresses in plants. Areas emphasized are general stress concepts, physiological responses of plants to selected environmental stresses and integration of stresses.

135. Mineral Nutrition of Plants (4) III. Richards (Land, Air, and Water Resources), Brown (Pomology) Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 111 or the equivalent. Evolution and scope of plant nutrition; essential and other elements; mechanisms of absorption and translocation; mineral metabolism; deficiencies and toxicities; genetic and ecological aspects of plant nutrition. (Same course as Botany 135.)

140. Principles of Plant Biotechnology (3) II. Dandekar (Pomology)

Lecture—3 hours. Prerequisite: Biological Sciences 1A and Genetics 100. Principles and concepts of plant biotechnology including recombinant DNA technology, plant molecular biology, plant cell and tissue culture, and crop improvement.

192. Internship (1-12) I, II, III, summer. The Staff (Rains (Agronomy and Range Science) in charge) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off or on campus in all subject areas pertaining to Plant Science. Internships supervised by a member of the faculty. (P/NP grading only.)

196. Postharvest Technology of Horticultural Crops (3) III. Kader (Pomology) in charge

Lecture-discussion-demonstration—5 days; field trip—5 days. Prerequisite: upper division or graduate student standing. Intensive study of current procedures for postharvest handling of fruits, nuts, vegetables, and ornamentals in California. Scheduled first two weeks immediately following last day of spring quarter. Considered a spring course for pre-enrollment. (P/NP grading only.)

197T. Tutoring in Plant Science (1-4) I, II, III. The Staff (Rains (Agronomy and Range Science) in charge)

Prerequisite: upper division standing; completion of course being tutored or the equivalent. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-instruction-format classes under faculty guidance. May be repeated once for credit if different course is tutored. (P/NP grading only.)

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

Graduate Courses

221A-221B. Applied Crop Physiology (4-4) III. Shennan (Vegetable Crops), Jackson (Vegetable Crops)

Lecture—1 hour; seminar—1 hour; laboratory—6 hours. Prerequisite: courses 101 and 102 or Botany 111, 112 or consent of instructor. Research methods in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports.

270. Reproductive Biology of Flowering Plants (3) I. Wu (Environmental Horticulture)

Lecture—2 hours; discussion—1 hour. Prerequisite: Botany 111 and Genetics 100. Fundamental mechanisms of reproductive biology of flowering plants and their impact on genetic variation, evaluation, and cultural practices. Offered in alternate years.

291. Seminar in Postharvest Biology (1) I, II, III. Saltveit (Vegetable Crops)

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)

Larry Berman, Ph.D., Chairperson of the Department
 Department Office, 227 Voorhies Hall (916-752-0966)

Faculty

- Donna L. Bahry, Ph.D., Professor
- Larry Berman, Ph.D., Professor
- Edmond Costantini, Ph.D., Professor
- Philip L. Dubois, Ph.D., Professor
- Richard W. Gable, Ph.D., Professor Emeritus
- Scott S. Gartner, Acting Assistant Professor
- John B. Gates, Ph.D., Assistant Professor
- Emily O. Goldman, Ph.D., Assistant Professor
- Alexander J. Groth, Ph.D., Professor
- Charles M. Hardin, Ph.D., Professor Emeritus
- Stuart L. Hill, Ph.D., Associate Professor
- Robert W. Jackman, Ph.D., Professor
- Clyde E. Jacobs, Ph.D., Professor Emeritus
- Bruce W. Jentleson, Ph.D., Associate Professor
- Joyce K. Kallgren, Ph.D., Professor
- Lloyd D. Musolf, Ph.D., Professor Emeritus
- Miroslav Nincic, Ph.D. Professor
- John R. Owens, Ph.D., Professor Emeritus
- Larry I. Peterman, Ph.D., Professor
- Donald S. Rothchild, Ph.D., Professor
- Gary M. Segura, Acting Assistant Professor
- Richard Sinopoli, Ph.D., Assistant Professor
- Randolph M. Siverson, Ph.D., Professor
- Andrew Skalaban, Ph.D., Assistant Professor
- Alvin D. Sokolow, Ph.D., Professor
- Larry L. Wade, Ph.D., Professor
- Geoffrey A. Wandesforde-Smith, Ph.D., Associate Professor (*Political Science, Environmental Studies*)
- Marvin Zetterbaum, Ph.D., Professor Emeritus
- Paul E. Zinner, Ph.D., Professor

The Major Programs

Political science is the study of politics and political systems at the local, national, and international levels. It concerns not only the institutions of government but also the analysis of such phenomena as political behavior, political values, political change and stability, parties, pressure groups, bureaucracies, administrative behavior, justice, national security, and international affairs.

The Program. The Department of Political Science offers two major programs: political science and political science—public service. The political science major aims to provide the student with a broad understanding of political concepts, political institutions, political behavior, and political processes. The political science—public service major is designed for students who desire opportunities for practical hands-on experience in their major. It differs in particular from the political science major in its internship requirement and its focus on the American political system.

Internships and Career Alternatives. The proximity of UC Davis to the state capital affords exceptional internship possibilities in local, state, and national government offices, providing students with actual experience in politics and government service while still attending school. A student who majors in political science acquires research and analytic skills relevant to many professional fields. Consequently, the majors offered in political science are valuable not only in providing students with a better understanding of politics and political systems, but also as a first step toward careers in teaching, law, management, government,

urban planning, journalism, politics, administration, or for graduate studies in numerous fields.

Political Science

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	19-20
Three courses from Political Science 1, 2, 3, 4, 5, 7	11-12
(Course 7 may not be taken if course 5 is taken.)	
Two courses from History 3, 4A, 4B, 4C, 10, 11A, 11B, 11C, 121A, 121B, 121C, 131A, 131B, 131C, 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, 173-175, 191, 195	
(3) Parties and political behavior: Political Science 160-170	
(4) Public law: Political Science 150-156	
(5) Public administration: Political Science 180-189	
Group C	
(6) Comparative government: Political Science 140-142, 145-149, 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, 192B, or 192W may not be counted toward a field requirement.	
Total Units for the Major	55-56

Political Science—Public Service

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	11-12
One course from Political Science 1, 5, 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, or 192W	10
Research paper, Political Science 193	2
Fields of concentration	24
Select six upper division courses from two or three fields of concentration listed below with at least two courses in each field selected; at least 16 of the units must be in political science. (Core Program courses may not be counted toward this requirement.)	
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) *Policy Implementation and evaluation:* Political Science 156, 180, 181, 182, 183, 187, 188, 189; Economics 131
- (3) *Policy Interpretation—Substance and procedures (public/pre-law):* Political Science 150, 151, 152, 153, 155, 156.
- (4) *Policy areas:*
 - a) Urban policy and implementation: Political Science 100, 101, 102, 191, Economics 125, Environmental Biology and Management 110, Environmental Studies 162, 173.
 - b) Environmental policy and implementation: Political Science 107, Economics 123, Environmental Studies 160, 161, 166, 168A-168B, 179.
 - c) ——— policy and implementation: open field that might include courses relevant to health care, welfare, education, community development, transportation, science and technology, etc. (requires approval of Political Science—Public Service adviser).

Major Advisers. Consult Departmental Office.

Minor Program Requirements:

Students electing a minor in Political Science may choose one of two plans:

	UNITS
Political Science	24

Plan I: Upper division units in political science (may include 4 units of lower division course work) distributed among at least two of the three Groups, A, B, and C, or a 24-unit plan approved by a faculty adviser. Five units of internship may count toward the minor.

Teacher Credential Subject Representative. Consult Departmental Office. See also the section on the Teacher Education Program.

Graduate Study. The Department offers programs of graduate study and research leading to the M.A. and Ph.D. degrees. Information concerning admission to these programs and requirements for completion are available in the department office.

Graduate Adviser. Consult Departmental Office.

Public Affairs Internship Program. This program is open to upper division students in any major who want to obtain an internship in the area of government and public service. Information and applications are available from the Intern Coordinator, Political Science Department, 226 Voorhies Hall, 752-1989.

American History and Institutions. This University requirement may be satisfied by passing any one of the following Political Science courses: 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163. (See also under University requirements.)

Courses in Political Science

Lower Division Courses

- 1. American National Government** (4) I. Hill; II. The Staff; III. Segura
 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) I. Groth; III. The Staff
 Lecture—3 hours; discussion—1 hour. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Coverage is given to cultural and other informal dimensions of politics as well as to more formal political and governmental structures. General Education credit: Contemporary Societies/Introductory.

*Course not offered this academic year.

- 3. International Relations** (4) I. Nincic; II. Gartner; III. Siverson
Lecture—3 hours; discussion—1 hour. International conflict and cooperation, including the Cold War, nuclear weapons, and new techniques for understanding international politics.
- 4. Basic Concepts in Political Theory** (4) II. Peterman
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) II. Skalaban
Lecture—3 hours; discussion—1 hour. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies.
- 7. Contemporary Issues in Law and Politics** (4) I. Gates
Seminar—4 hours. A freshmen-sophomore seminar which focuses on the political dimensions of American law and institutions. Examines the role of courts in resolving contemporary issues of law and politics including abortion, capital punishment, and civil rights. Limited enrollment.
- 99. Special Study for Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

- 100. Local Government and Politics** (4) I. 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. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or consent of instructor. Historical development of urban political economies. Focuses on ways in which different groups have tried to use local government authority to achieve their objectives and why they succeeded or failed.
- *102. Urban Public Policy** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political and economic relationships among central cities, suburbs, and regional, state, and federal governments. Focuses upon policy areas such as poverty, transportation, welfare, and housing, and upon who governs and who benefits from the policies in these areas.
- 103. American Federalism** (4) III. Sokolow
Lecture—3 hours; research paper. Prerequisite: course 1 or 5 recommended. American politics and policy in the context of national-state-local relations. Constitutional roots of Federalism, centralizing and decentralizing tendencies, fiscal relations, current policy issues, and management of intergovernmental programs.
- 104. California State Government and Politics** (4) II. Sokolow
Lecture—3 hours; research paper. The California political system. Political culture, constitution, elections and parties, direct democracy, legislature, governor, executive branch, courts, finances, state-local relations, and policy issues.
- 105. The Legislative Process** (4) II. Segura
Lecture—3 hours; discussion—1 hour. Analysis of the legislative process with emphasis on the United States Congress; legislative organization and procedures, legislative leadership and policy making, legislators and constituents, relations between Congress and other agencies.
- 106. The Presidency** (4) III. Berman
Lecture—3 hours; discussion—1 hour; optional term paper. The American presidency's origins and development; presidential power and influence as manifested in relationships with Congress, courts, parties, and the public in the formulation and administration of foreign and domestic policy; nominations, campaigns, and elections.
- 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) I. Wade
Lecture—3 hours; discussion—1 hour. Major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in alternate years.
- 113. American Political Thought** (4) I. Sinopoli
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Origins and nature of American political thought. Principles of American thought as they emerge from the founding period to the present.
- 114. Quantitative Analysis of Political Data** (4) I. Skalaban
Lecture—3 hours; term paper. Logic and methods of analyzing quantitative political data. Topics covered include central tendency, probability, correlation, and non-parametric statistics. Particular emphasis will be placed on understanding the use of statistics in political science research. Offered in alternate years.
- 115. Medieval Political Thought** (4) I. Peterman
Lecture—3 hours; term paper. Prerequisite: course 118A. Examination of the ideas central to medieval political thinking. Emphasis will be upon the thoughts of the major political thinkers of the period, rather than upon political history.
- 116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher** (4) III. Peterman
Lecture/discussion—3 hours; term paper. Intensive analysis and evaluation of the seminal works of a major political philosopher.
- 117. Marxism** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Examination of the political and social philosophy of Karl Marx, with reference to the evolution of Marxism in the nineteenth and twentieth centuries.
- 118A. History of Political Theory** (4) I. Sinopoli
Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas.
- 118B. History of Political Theory** (4) II. Peterman
Lecture—3 hours; special assignments. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke.
- 118C. History of Political Theory** (4) III. Sinopoli
Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Nineteenth

and twentieth centuries: Hegel, Tocqueville, Mill, Marx, Nietzsche, Sartre.

***119. Modern Political Thought** (4) I. Sinopoli
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Study in depth of philosophers considered central to modern political thought, especially nineteenth and twentieth century political thought. Emphasis will be upon an individual philosopher or concept rather than upon a survey of modern political thought.

120. Theories of International Politics (4) I. Siverson
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) II. Siverson
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare.

***122. International Law** (4) 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, III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. In the past several decades, growing economic interdependence has generated new problems in international relations. Course deals with difficulties in managing complex interdependence and its implication on national policies and politics.

124. The Politics of Global Inequality (4) I. The Staff
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) II. 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 alternate years.

128. International Communism (4) III. 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 alternate years.

***129. Special Studies in International Politics** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing. Intensive examination of one or more special problems in international politics. May be repeated once for credit when different topic is studied.

130. Recent U.S. Foreign Policy (4) II, III. Gartner 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) II. The 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. Gartner Lecture—3 hours; discussion—1 hour. 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 alternate years.

134. Africa and U.S. Foreign Policy (4) I. Rothchild Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Overview of American foreign policy toward Africa. Relationship to global adversaries. Legacies of colonialism. Challenge of national self-determination and white racism. Policies on nonalignment, producer cartels, multinational corporations, continental integration, and trade and aid relations.

136. Soviet Foreign Policy (4) I. Zinner; II. Bahry 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, III.** Jentleson and 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) II. Groth Lecture—3 hours; term paper. Ideological orientations, institutions, processes, and public policies of modern states. Emphasis on democratic, socialist, communist and fascist experience.

141. Communist Political Systems (4) II. Bahry; 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.

142. Politics and Inequality (4) II. Jackman Lecture—3 hours; term paper or discussion—1 hour. Examines the linkages between politics and the distribution of social and economic goods. Topics include the impact of civil rights legislation, the politics of welfare states, and the effects of political participation on the distribution of goods.

***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 alternate 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) II.** 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.

***148C. Government and Politics in East Asia:**

Southeast Asia (4) III. Kallgren

Lecture—3 hours; term paper. Prerequisite: course 2 recommended. Evolution of political culture, institutions, economy of selected nations in Southeast Asia including Vietnam plus two or three other examples. Emphasis on imperialist legacy, nation building in multi-ethnic communities, contrasts between socialist and non-socialist development models. Offered in alternate years.

149. Politics of Development in Africa

(4) III. Rothchild.

Lecture/discussion—4 hours. Prerequisite: course 134 recommended. Analysis of the developmental process in sub-Saharan Africa. Emphasis will be placed upon state and state institution, state-society relations, ethnicity, socioeconomic class, women, ideology, party systems, bureaucracy, military and developmental choices.

150. Judicial Politics and Constitutional Interpretation (4) II. Gates

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Politics of judicial policymaking; issues surrounding constitutional interpretation and decisionmaking; prerequisite for courses on the politics of constitutional law.

151. The Constitutional Politics of the First

Amendment and the Right to Privacy (4) III. Gates Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. The constitutional politics surrounding such issues as the right to free expression, associational rights, the right to free exercise of religious beliefs, and the right to privacy.

152. The Constitutional Politics of Equality (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. Constitutional politics of equality in the American political system; issues surrounding constitutional doctrine and judicial policymaking; special attention on racial and sexual equality. Offered in alternate years.

153. The Constitutional Politics of the Justice

System (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 150. Constitutional politics of the American criminal justice system; the issues surrounding constitutional doctrine and judicial policymaking on

issues such as search and seizure, arrest, trial, incarceration, and other issues of due process. Offered in alternate years.

***154. Legal Philosophy (4) III.** Sinopoli

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Analysis of the nature and functions of law; law as an instrument of social control and the relationship between law and morality. Offered in alternate years.

155. Judicial Process and Behavior (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Analysis of the behavior of judges and courts in the political process. Techniques of judicial decisionmaking. Relationships among courts and other decision-making bodies. Offered in alternate years.

***156. Law and Society (4) II.** Gates

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing. Social basis and origins of law; relationship between law, institutions, and social change. Offered in alternate years.

160. American Political Parties (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Analysis of the structured operations of the party system in the United States; party functions and organizations, nomination processes, campaigns and elections, party trends and reforms.

***161. Comparative Political Parties (4) II.** The Staff Lecture—3 hours; discussion—1 hour. Organization, operation, governmental function and social bases of political parties especially in Great Britain and France but with some reference to other Western European countries.

162. Elections and Voting Behavior (4) III. Segura Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 recommended. Analysis of American elections and partisan behavior; political socialization, political participation, partisanship and individual and group determinants of voting.

163. Group Politics (4) II. 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) II. Jackman

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/her political environment.

***169. Political Elites (4) I, II.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 2, or 4, or consent of instructor. Background, careers, motives and beliefs of political leaders. Place of elites in a democratic polity; elite-mass differences; conflict and consensus among elites.

***170. Politics and Personality (4) III.** Berman

Lecture—3 hours; discussion—1 hour. How is conduct of politics influenced by personal qualities of political actors? Course focuses on developing criteria for analyzing political phenomena in psychological terms by examining selected writings of twentieth-century theorists and psychobiographies.

171. The Politics of Energy (4) II. Wandesforde-Smith

Lecture-discussion—4 hours. Prerequisite: upper division standing. Analysis of nature and performance of political processes for making energy choices at the international, national and state levels. Emphasizes interaction of energy policy with other political goals and the ability of governmental institutions to overcome constraints on policy innovation.

***173. Community Power and Change (4) II.** Jackman

Lecture—3 hours; discussion—1 hour. An examination of the relationship between general community characteristics, the distribution of political power, and policy outputs in the United States. Alternative models of community political change are presented.

174. Government and the Economy (4) I. Skalaban

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political basis of economic policy (taxation, spending and regulation); impact of prices, employment and growth on political demands; elite responses to economic conditions; policy alternatives and the public interest.

175. Science, Technology, and Policy (4) 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.

***176. Power and Coercion (4) II.** Jackman

Lecture—4 hours. Prerequisite: course 1 or Sociology 1 recommended. Examination of the meaning, sources, and diverse expressions of power and coercion in our lives. Concepts are explored by applying them to a broad range of issues, such as sexual harassment, racial subordination, legislative policy-making, and ideological hegemony.

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) I. Jackman

Lecture—3 hours; discussion—1 hour. Nature and sequence of political development; its economic and social concomitants; role of elites, military, bureaucracy, and party systems; social stratification and group politics; social mobilization and political participation; instability, violence, and the politics of integration.

179. Special Studies in Comparative Politics (4) III. Bahry

Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to comparative politics. May be repeated once for credit.

***180. Bureaucracy in Modern Society (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or con-

sent 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) III. The Staff

Lecture—3 hours; special assignments. Approaches to and models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

183. Administrative Behavior (4) I. The Staff

Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations.

***187. Administrative Theory (4) I.** The Staff

Lecture—3 hours; discussion—1 hour. Historical and critical analysis of the principal theories of organization and management of public agencies in the light of such concepts as decision making, bureaucracy, authority and power, communication and control; an examination of the role of government bureaucracies in the total society.

***188. Manpower Policy and Personnel Administration (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Politics and economics of effective manpower programs; planning manpower needs; recruitment, selection, and administration of public personnel; training and development; unions and collective bargaining; affirmative action; ethics and morality in the public service.

***189. Politics of Budgeting and Finance Administration (4) III.** The Staff

Lecture—3 hours; discussion—1 hour. Fiscal role of government in mixed economy and democratic society; politics of revenue and resource allocation; tax policy; inter-governmental financial relations; budget formulation and execution; alternative models of resource allocation; budget as a tool of management.

***190. International Relations (4) II.** 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; fieldwork—1 hour. Prerequisite: consent of instructor; enrollment limited to advanced students. Intensive study of one or more topics relating to urban policy and politics, designed for advanced students. Group projects and field work in one or more communities are emphasized.

192A. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

192B. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: course 192A; enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

192W. Internship in the UC Davis Washington Center Program (6-8) I, III. Jentleson and staff

Internship—30-35 hours. Prerequisite: junior or senior standing and admission in the UC Davis Washington Center undergraduate program. Internship in Washington, D.C. with associated research project, under the supervision of a faculty sponsor. (P/NP grading only.)

193. Research in Practical Politics (2) I, II, III. The Staff

Research project—6 hours. Prerequisite: courses 192A, 192B; open only to Political Science—Public Service majors for whom it is required. Supervised preparation of an extensive paper relating internship experience to concepts, literature, and theory of political science.

194HA-194HB-194HC. Special Study for Honors Students (2-3-5) I, II, III. The Staff

Directed research. Prerequisite: major in Political Science or Political Science—Public Service with junior standing and overall grade-point average of 3.5. Directed reading, research, and writing culminating in the preparation of a senior honors thesis under direction of faculty adviser. (Deferred grading only, pending completion of sequence.)

195. Special Studies in American Politics (4) I. 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

201. Urban Government and Politics (4) III.

Sokolow

Seminar—4 hours. Survey and analysis of the literature in the field of local government and politics in the United States. Approaches to the study of political reform, local autonomy, community power, representation, expertise, service delivery, policy-making and political change. Offered in alternate years.

***202. American State Government and Politics (4) I.** Sokolow

Seminar—4 hours. Survey and analysis of the literature in the field of state government, politics, and policy. Approaches to the study of the American states as political systems, including their governing institutions and processes and their role in the Federal system. Offered in alternate years.

203. American National Government (4) III.

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.

211. Research Methods in Political Science (4) I. Jackman

Seminar—4 hours. Prerequisite: Statistics 13; graduate standing or permission of instructor. Introduction to philosophy of science, research design for experimental and quasi-experimental settings, and data analysis. Topics include: logic of empirical research, measurement problems, research design, sampling, descriptive statistics, tabular analysis, measures of association, and introduction to correlation and regression.

212. Quantitative Analysis in Political Science (4) II. Skalan

Seminar—4 hours. Prerequisite: course 211. Topics usually covered in an introductory statistics course with an emphasis on applications in political science—descriptive statistics for samples, probability and probability distributions, hypothesis testing, ANOVA, bivariate regression, and introduction to multiple regression.

***213. Quantitative Analysis in Political Science II (4) III. The Staff**

Seminar—4 hours. Prerequisite: courses 211, 212. More advanced topics in the use of statistical methods, with emphasis on political applications. Topics include: properties of least squares estimates, problems in multiple regression, and advanced topics (probit analysis, simultaneous models, time-series analysis, etc.)

***218. Political Theory (4) II. Sinopoli**

Seminar—3 hours.

***223. International Relations (4) I. Siverson**

Seminar—3 hours; term paper.

225. The International System (4) I. Siverson

Seminar—3 hours; term paper. Analysis of the international system by means of theory formulation and integration; critique of research designs; use of various techniques of data generation and analysis.

230. American Foreign Policy (4) III. Nincic

Seminar—3 hours; term paper.

231. U.S. Political Culture and Foreign Relations (4) III. Rothchild

Seminar—3 hours; term paper. Relates U.S. political culture to formulation of foreign policy. Analyzes American ideological preferences in historical perspective, contemporary public opinion, decision-making and implementation. Concludes by examining linkages between foreign policy behavior and democratic process. Offered in alternate years.

***241. Communist Political Systems (4) I. Bahry**
Seminar—4 hours. Prerequisite: course 141 or the equivalent, or consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

242. Seminar in Comparative Politics (4) II. Groth
Seminar—3 hours; term paper. Prerequisite: graduate status or consent of instructor. Systematic survey of theories and methods used in the study of Comparative Politics.

***246. Policymaking in Third-World Societies (4) II. Rothchild**

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Included in an analysis of policy making process in Third-World countries are such topics as political resources, institutional resources, decision-making, resource allocations, planning, and budgeting, implementation, and distribution of world resources. Offered in alternate years.

***248. Politics of East Asia (4) III. Kallgren**

Seminar—3 hours; term paper. Selected contemporary problems of government and international relations in East Asia.

***260. Political Parties (4) II. The Staff**

Seminar—3 hours; term paper. Survey of selected topics in American and comparative parties.

***261. Political Behavior (4) III. Costantini**

Seminar—3 hours; term paper. 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; means of controlling bureaucracy. Offered in alternate years.

***283. Organizational Behavior (4) II. The Staff**

Seminar—4 hours. Organizational behavior as it relates to public sector decision-making.

***286. Administrative Values (4) III. The Staff**

Seminar—3 hours; term paper. Examination of American administrative values. Offered in alternate years.

290A. Research in American Government and Public Policy (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of American government and public policy.

290B. Research in Political Theory (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of political theory.

290C. Research in International Relations (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of international relations.

290D. Research in Judicial Politics (4) I, II, III. The Staff

Seminar—4 hours. Prerequisite: graduate standing in political science or consent of instructor. Contemporary research on judicial politics, judicial institutions, jurisprudence, and judicial behavior.

290E. Research in Political Parties, Politics, and Political Behavior (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of political parties, politics, and political behavior.

290F. Research in Comparative Government and Policy (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of comparative government and policy.

290G. Research in Public Administration (4) I, II, III. The Staff

Seminar—4 hours. Special research seminar on selected problems and issues in the study of public administration.

297. Internships in Political Science (2) I, II, III. The Staff

Seminar—2 hours. Prerequisite: open only to persons who have internships or other positions in governmental agencies, political parties, etc. 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 Course**390. The Teaching of Political Science (1) I, II, III. The Staff**

Seminar—1 hour. Prerequisite: graduate student standing in Political Science. Methods and problems of teaching political science at the undergraduate level. (S/U grading only.)

Pomology

(College of Agricultural and Environmental Sciences)

———, Chairperson of the Department

Department Office, 1045 Wickson Hall (916-752-0123)

Faculty

Fredrick A. Bliss, Ph.D., Professor
Royce S. Bringham, Ph.D., Professor Emeritus
Dillon S. Brown, Ph.D., Professor Emeritus
Patrick H. Brown, Ph.D., Assistant Professor
Robert M. Carlson, Ph.D., Lecturer
Peter B. Catlin, Ph.D., Lecturer
Julian C. Crane, Ph.D., Professor Emeritus
Carlos H. Crisosto, Ph.D., Lecturer
Abhaya M. Dandekar, Ph.D., Associate Professor
Theodore M. DeJong, Ph.D., Professor
Louise Ferguson, Ph.D., Lecturer
Thomas M. Gradziel, Ph.D., 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 Emeritus
John M. Labavitch, Ph.D., Professor
Omund 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., Professor
David E. Ramos, Ph.D., Lecturer
Roger J. Romani, Ph.D., Professor
Kay Ryugo, Ph.D., Professor Emeritus
Kenneth A. Shackel, Ph.D., Assistant Professor
Douglas V. Shaw, Ph.D., Assistant Professor
Noel F. Sommer, Ph.D., Lecturer Emeritus
Stephen M. Southwick, Ph.D., Lecturer
Ellen G. Sutter, Ph.D., Associate Professor
Kiyoto Uriu, 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. The Art and Science of Fruit Production (3) I.**

The Staff (Martin in charge)

Lecture—2 hours; discussion—1 hour. Introduction to pomology including: climatic adaptation of deciduous fruits; orchard planning and management; tree nutrition and physiology; fruit development, maturation, and harvesting; protection from cold; quality, storage, transportation, and marketing. One all-day Saturday field exercise in lieu of discussion meeting for last 5 weeks of quarter. General Education credit: Nature and Environment/Introductory.

92. Internship in Pomology (1-12) I, II, III. The Staff

(Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on and/or off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

Upper Division Courses**101. Tree Growth and Development (4) II. DeJong, Brown**

Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1C or Plant Science 102 or consent of instructor. Physiology of fruit plant growth and maintenance; species adaptation; responses to envi-

ronment 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: Biological Sciences 1C 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: Biological Sciences 1C. 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 alternate years.

107. Small Fruit Production (2) II. Shaw

Lecture—2 hours; two field trips arranged at mutual convenience. Prerequisite: Biological Sciences 1C or the equivalent. Strawberries (*Fragaria*), blackberries-raspberries (*Rubus*), blueberries-cranberries (*Vaccinium*), and currants-gooseberries (*Ribes*) as important nutritional resources; their origin, production and utilization with emphasis on recent progress in integrated management. Offered in alternate 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. Offered in alternate years.

192. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on and off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

203. Current Perspectives in Fruit Tree Physiology (3) I. Weinbaum, DeJong

Lecture—2 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B, Botany 111, 112 or Plant Science 102; courses 101 and 102. Current advances/concepts regarding physiological bases of developmental phenomena specific to and/or characteristic of deciduous perennial fruit plants. Offered in alternate years.

***205. Water Relations and Mineral Nutrition of Deciduous Fruit Crops (4) III.** Carlson, Shackel

Lecture—3 hours; two full-day field trips. Prerequisite: Soil Science 109, Botany 111, 112 or Plant Science 102. Development and distribution of roots, irrigation and water relations, mineral nutrient status, deficiencies and excesses, symptoms, use of tissue analysis, chelates and deficiency corrections as factors in orchard management. Offered in alternate years.

210. Plant Reproductive Morphology (4) III. Polito

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Botany 105, or Botany 111A and 111B. Biology and morphology of flowering plant sexual reproduction. Specific topics include evocation, floral transition and organogenesis, ovule and pollen development, pollination, self-incompatibility, fertilization, fruit set and fruit morphology. Emphasis on species of pomological interest.

***212. Postharvest Biology and Biotechnology of Fruits and Nuts (3) III.** Kader, 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 alternate 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 alternate years.

221. Principles and Practices of Line Cultivar Breeding (3) III. Bliss

Lecture—3 hours. Prerequisite: Genetics 100, Plant Science 113, Agronomy 205A. Application of genetic principles and selection theory to the production and testing of inbred lines in self- and cross-pollinated crops. Topics include types of cultivars, genetic parameters of inbreeding populations and breeding methods to produce superior inbreds. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff (McGranahan, Polito, Brown in charge)

Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III, Summer. The Staff (Chairperson in charge)

(S/U grading only.)

Portuguese

See Spanish

Preventive Veterinary Medicine (A Graduate Program)

Group Office, 112 Surge-IV (916-752-2375/9174)

Graduate Study. The School of Veterinary Medicine offers a program of study and research leading to the Master's degree in Preventive Veterinary Medicine (M.P.V.M.). Detailed information on this program may be obtained by writing the Director, Department of Epidemiology and Preventive Veterinary Medicine.

Director. Richard Yamamoto (Epidemiology and Preventive Medicine).

Psychiatry

See Medicine, School of

Psychology

(College of Letters and Science)

Donald H. Owings, Ph.D., Chairperson of the Department

Department Office, 149 Young Hall (916-752-1880)

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
 Rebecca A. Eder, Ph.D., Assistant Professor
 Alan C. Eims, Ph.D., Professor
 Robert A. Emmons, Ph.D., Associate Professor
 Karen P. Erickson, Ph.D., Professor
 Albert A. Harrison, Ph.D., Professor
 Kenneth R. Henry, Ph.D., Professor
 Joel T. Johnson, Ph.D., Associate Professor
 Neal E.A. Kroll, Ph.D., Professor
 Debra L. Long, Ph.D., Assistant Professor
 Joseph Lyons, Ph.D., Professor Emeritus
 Peter R. Marler, Ph.D., Professor (*Zoology*)
 William A. Mason, Ph.D., Professor
 Sally P. Mendoza, Ph.D., Associate Professor
 G. Mitchell, Ph.D., Professor
 Robert M. Murphey, Ph.D., Professor
 Thomas Natsoulas, Ph.D., Professor
 Donald H. Owings, Ph.D., Professor
 Theodore E. Parks, Ph.D., Professor
 Robert B. Post, Ph.D., Associate Professor
 Stephanie A. Shields, Ph.D., Professor
 Dean K. Simonton, Ph.D., Professor
 Robert Sommer, Ph.D., Professor
 Charles T. Tart, Ph.D., Professor
 Niels G. Waller, Ph.D., Assistant Professor

The Major Programs

Psychology provides knowledge of and means of studying human and animal behavior.

The Program. The department offers the Bachelor of Arts degree for the student interested in the liberal arts and the Bachelor of Science program designed for students with an interest in either biology or mathematics. The psychology program is extremely broad and represents a wide variety of topics. The courses are organized around three focal points: *Personality/Social* emphasizes the individual in the social environment and includes such topics as personality theory, social psychology, abnormal psychology, individual differences, developmental psychology, humanistic psychology, and motivation. *Psychobiology* emphasizes the biological correlates of behavior and includes such topics as sensory psychology, physiological psychology, and comparative psychology. *Perception/Cognition* emphasizes how information from the physical world is sensed, perceived and used, and examines the roles of consciousness, language, perception, and learning in behavior.

Preparatory Requirements. Before declaring a major in psychology, students must complete the following courses with a combined grade point average of at least 2.50 (all courses must be taken for a letter grade):

Psychology 1, 41	8 units
Statistics 13 or 102	4 units
Biological Sciences 1A	
or	
Biological Sciences 10	
and one course from	
Anthropology 1, Genetics	
10, Physiology 10	5 or 8 units
Sociology or cultural	
anthropology	4 units

Career Alternatives. A degree in psychology provides broad intellectual foundations which are useful to the graduate for the development of careers in a variety of areas, including social work, the ministry, teaching, business, and counseling. An undergraduate education in psychology also provides excellent preparation for graduate study. Individuals with degrees in psychology may enter graduate programs to prepare for teaching, research, or clinical/counseling careers in psychology, or may go on to professional schools for training in veterinary and human medicine, law, and other professions.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter	21-25
Psychology 1 or the equivalent	4

*Course not offered this academic year.

Psychology 41.....4
 Statistics 13 or 102.....4
 Biological Sciences 1A; 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.....40
 Two courses from two of the following three groups and one course from the remaining group.....21-22
 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.....18-19
Total Units for the Major.....61-65

B.S. Major Requirements:

Biology Emphasis UNITS

Preparatory Subject Matter.....46-53
 Psychology 1 or the equivalent.....4
 Psychology 41.....4
 Statistics 13 or 102.....4
 Mathematics 16A-16B or 21A-21B.....6-8
 Physics 10 or 5A-5B.....4-8
 Biological Sciences 1A, 1B.....10
 Chemistry 1A, 1B.....10
 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.....52-53
 Seven Psychology courses distributed as specified: Group A: two courses from 130, 131, 132, 135, 136.....8
 Group B: three courses from 108, 129, 134, 150.....15
 Group C: two courses from 112, 143, 145, 147, 168.....8
 Additional units to achieve a total of 40 upper division units in psychology.....9
 Genetics 100.....4
 Zoology 125 or 148.....3-4
 Physiology 110.....5
Total Units for the Major (Biology Emphasis).....98-106

Recommended: Psychology 154, 180B, 199 (on a psychobiological topic), Zoology 105, 106, Anthropology 154A, Environmental Studies 110.

Mathematics Emphasis UNITS

Preparatory Subject Matter.....44-58
 Psychology 1 or the equivalent.....4
 Psychology 41.....4
 Statistics 13 or 102.....4
 Mathematics 21A, 21B, 21C,.....12
 Computer Science Engineering 30 or Engineering 5.....3
 Chemistry 10 or 1A-1B or 4A-4B.....4-10
 Physics 10 or 5A-5B.....4-8
 Biological Sciences 1A; or a combination of Biological Sciences 10 and one course from Anthropology 1, 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
 Group B: two courses from 108, 129, 134, 150.....10
 Group C: one course from 112, 143, 145, 147, 168.....4
 Psychology 103.....5
 One course from Psychology 105, 206, 207.....4
 Additional units to achieve a total of 40 upper division units in psychology.....9
 One course sequence from Statistics 106-108, 130A-130B, 131A-131B.....7-8
Total Units for the Major (Mathematics Emphasis).....91-106

Recommended for All Majors
 Psychology 103 is strongly recommended for students who plan to do graduate work in any area of psychology. Psychology 41 is a prerequisite for most upper division courses.

Major Advisers. L.P. Acredolo, L.M. Chalupa, R.G. Coss, R.A. Eder, A.C. Elms, R.A. Emmons, K.P. Erickson, A.A. Harrison, K.R. Henry, J.T. Johnson, N.E.A. Kroll, D.L. Long, 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, N.G. Walker.

Honors and Honors Program. In order to be eligible for high or highest honors in Psychology, the student must both meet the college criteria and complete a research project involving a minimum of six units of course work over at least two quarters which represents an original analysis of data on psychological phenomena. This project is to be written in thesis form and approved by the department. The quality of the thesis work will be the primary determinant for designating high or highest honors at graduation.

Minor Program Requirements: UNITS

Psychology.....24
 Psychology 1 or the equivalent.....4
 One course from each of the following three groups.....13
 Group A: Psychology 130, 131, 132, 135, 136
 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.....7

Graduate Study. The Department offers programs of study and research leading to the Ph.D. degree in psychology. Detailed information regarding graduate study may be obtained by writing the Graduate Adviser, Department of Psychology.

Graduate Adviser. See *Class Schedule and Room Directory*.

Courses in Psychology

Lower Division Courses

- 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. (CAN Psy 2)
- 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.

***20. Freshman Psychology Seminar (4) I, II, III.** The Staff
 Seminar—4 hours. Prerequisite: freshman standing. Instructor will acquaint students with his or her program of research, the development of scientific questions from the literature, and the application of research methods to examine these questions. Critical thinking will be encouraged via expository writing and brief presentations.

41. Research Methods in Psychology (4) I, II, III. Mitchell
 Lecture—4 hours. Prerequisite: course 1 or the equivalent; completion of Statistics 13 or 102 strongly recommended. Introduction to experimental design, interviews, questionnaires, field and observational methods, reliability and statistical inference.

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 41, course 103 or consent of instructor. Probability theory, sampling distributions, hypothesis testing, statistical inference, and nonparametric statistics, with applications in sensory, perceptual, comparative, physiological, and other areas of psychology.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry, Mendoza
 Lecture—4 hours; laboratory—2 hours. Prerequisite: courses 1, 41; at least one zoology or physiology course recommended. Relationship of brain structure and function to emotion, motivation, perception, states of consciousness, language, learning, and memory in humans and other animals; introduction to methods of physiological psychology.

112. Developmental Psychology (4) I, II, III. Mitchell, Shields, Acredolo, Eder
 Lecture—4 hours. Prerequisite: courses 1, 41. An ontogenetic account of human behavior through adolescence with emphasis on motor skills, mental abilities, motivation, and social interaction.

114. Gender and Social Development (4) II, III. Shields
 Lecture—4 hours. Prerequisite: courses 1, 41. Biological and social factors that influence when and how psychological sex-related differences will be expressed in human development. Special attention to the scientific and social rationale which underlie the study of gender.

115. Maturity and Aging (4) II. The Staff
 Lecture—4 hours. Prerequisite: courses 41, 112. Biological, cognitive, personological, and social aspects of the human life span between early maturity and death, in its theoretical, methodological, and empirical aspects.

120. History of Psychology (4) I, III. The Staff
 Lecture—3 hours; term paper. Prerequisite: courses

*Course not offered this academic year.

1, 41; upper division standing or consent of instructor. Development of psychological thought and research in context of history of philosophy and science.

129. Sensory Processes (5) I, II, Henry, Mendoza
Lecture—4 hours; discussion, project, or term paper—1 hour. Prerequisite: course 1 or Biological Sciences 1B or consent of Instructor, and course 41. Psychobiology of sensory systems in man and other animals. Relationship of behavior to physiology, structure and function of the senses.

130. Human Learning and Memory (4) I, III, Kroll, Parks
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 41, and either Statistics 13 or 102; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data.

131. Perception (4) I, II, III, Natsoulas, Parks, Post
Lecture—3 hours; independent library work. Prerequisite: courses 1, 41. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

132. Language and Cognition (4) I, Long
Lecture—4 hours. Prerequisite: course 1 or the equivalent, course 41, and 6 units of upper division work in psychology or linguistics. Zoological, cultural, and individual perspectives of linguistic actions; their production, perception, cognitive significance, and their roles in human conduct, enculturation, and cognitive development.

134. Animal Learning and Motivation (5) II, Coss
Lecture—5 hours. Prerequisite: course 1 or 15 or consent of instructor; course 41. General theories of phylogenetic differences in learning and motivation drawing upon data from laboratory and field observations. Innate physiological mechanisms, developmental changes, effects of conditioning and other constraints on these processes are examined.

135. Psychology of Consciousness (4) I, II, III, Natsoulas
Lecture—4 hours. Prerequisite: courses 1, 41. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data.

136. Cognitive Psychology (4) I, II, Kroll, Long
Lecture—3 hours; term paper. Prerequisite: courses 1, 41. Introduction to human information processing, mental representation and transformation, imagery, attention, concept formation, problem solving, and computer simulation.

137. Altered States of Consciousness (4) I, II, Tart
Lecture—4 hours. Prerequisite: courses 1, 41. Characteristics, uses, and abuses of altered states of consciousness from experiential, behavioral, physiological, and methodological perspectives. Topics typically include sleep, borderline states, dreams, meditation, hypnosis, autohypnosis, marijuana intoxication, psychedelic drugs, and mystical experiences.

143. Human Emotion and Feeling (4) II, III, Natsoulas, Shields
Lecture—4 hours. Prerequisite: Introductory psychology course, and course 41. An introduction to current theories and research on emotion and bodily feelings with special reference to self-knowledge.

144. Environmental Awareness (4) I, 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: courses 1, 41. Behavior of the individual in the group. Examination of basic psychological processes in social situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status.

147. Personality Theory (4) I, II, III, Elms, Emmons, Erickson
Lecture—4 hours. Prerequisite: courses 1, 41. The theories of Freud, Erikson, and other major twentieth-

century approaches to personality.

149. Gender and Human Reproduction (4) I, Erickson
Lecture—4 hours. Prerequisite: courses 1, 41. The social psychology of human reproduction. Examines gender relations over the course of the individual's reproductive cycle.

150. Comparative Psychology (5) I, II, III, Mason, Owings, Mitchell
Lecture—4 hours; discussion or project—1 hour. Prerequisite: course 1 or 15 or consent of instructor; course 41. Perspectives in animal behavior: psychological, ethological, and social systems, with an emphasis on functional behavioral categories from the standpoint of adaptation and evolution.

154. Primate Psychology (4) III, Mitchell
Lecture—4 hours. Prerequisite: course 41; course 15 or 150 or an equivalent course in biological sciences, and consent of instructor. Comparative survey of primate psychology, based primarily on laboratory experimentation in learning, communication, cognition, sensation, motivation, emotion, perception, and effects of early experience in many species of primates.

160. Health Psychology (4) I, III, Emmons
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 15, course 41. Psychological factors influencing health and illness. Topics include stress and coping, personality and health, symptom perception and reporting, heart disease, cancer, compliance, and health maintenance and promotion. Application of principles in laboratory exercises.

165. Introduction to Clinical Psychology (4) I, II, III, The Staff
Lecture—4 hours. Prerequisite: courses 1, 41, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical psychoanalysis to contemporary existentialism and behavior modification. A survey, based on lectures, films, and tapes, of what clinical psychologists do, including methods of appraisal, professional roles, and approaches to treatment.

168. Abnormal Psychology (4) I, II, III, Emmons, Murphey, Sommer, Waller
Lecture—4 hours. Prerequisite: courses 1, 41. Descriptive and functional account of behavioral disorders, with primary consideration given to neurotic and psychotic behavior.

171. Humanistic and Transpersonal Psychology (4) II, III, Tart
Lecture—4 hours. Prerequisite: courses 41; course 165 or the equivalent and consent of instructor. Survey, including lectures and demonstrations, of humanistic, and transpersonal movements in contemporary psychology. Theory, data, and techniques in the work of Maslow and others who emphasize creativity, self-actualization, and realization of human potential.

175. Genius, Creativity, and Leadership (4) I, III, Simonton
Lecture—4 hours. Prerequisite: course 1 or 16; course 41. The phenomenon of genius is examined from a diversity of theoretical, methodological, and disciplinary perspectives, with an emphasis on outstanding creativity and leadership in art, music, literature, philosophy, science, war, and politics. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Psychology 15 and 16

177. Psychobiography and Life History (4) II, Elms
Lecture—4 hours. Prerequisite: course 1 or 16 or consent of instructor; course 41. Case-history research as a nonquantitative approach to studying personality. Psychological interpretation of life histories of outstanding individuals in the arts, politics, science and other areas. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: Psychology 15 and 16.

180A. Research in General Experimental Psychology (4) III, The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses

and consent of instructor. Empirical research on selected topics in general experimental psychology (general research design and analysis, perception, cognition, cognitive development, etc.). Specific content will vary from quarter to quarter. May be repeated once for credit when the content differs.

180B. Research in Psychobiology (4) II, III, The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses and consent of instructor. Empirical research on selected topics in psychobiology (animal learning and motivation, comparative psychology, physiological psychology, sensory psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

180C. Research in Personality and Social Psychology (4) II, The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 41, and four upper division Psychology courses and consent of instructor. Empirical research on selected topics in personality and social psychology (personality, social psychology, organizational psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

183. Organizational Psychology (4) II, Harrison
Lecture—4 hours. Prerequisite: Introductory psychology course; course 41. Survey of interrelationships among psychological processes, interpersonal dynamics, and organizational forms. Topics include motivation, communication, decision making, leadership, personnel selection and training, stress and conflict, career development, organizational development, and organization-community relations.

190. Seminar in Psychology (4) I, The Staff
Seminar—4 hours. Prerequisite: junior or senior standing; major in psychology or consent of instructor. Intensive treatment of a special topic or problem of psychological interest. May be repeated for credit in different subject area.

192. Fieldwork in Psychology (1-6) I, II, III, Harrison
Internship—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.)

204. Advanced Applied Psychometrics: An Introduction to Measurement Theory (4) III, Waller
Lecture—4 hours. Prerequisite: course 41, 103, Statistics 13. Examination of the basic principles and applications of classical and modern test theory. Topics include test construction, reliability theory, validity theory, factor analysis and latent trait theory.

205. Advanced Statistical Inference from Psychological Experiments (5) II. Kroll

Lecture—5 hours; project and term paper. Prerequisite: graduate student standing and consent of instructor. Probability theory, sampling distributions, nonparametric statistics, statistical inference, and hypothesis testing. A term paper will be required which develops a research proposal with a detailed discussion of the statistical techniques to be employed.

***206. Statistical Analysis of Psychological Experiments** (4)

Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Statistical analysis of data obtained with various experimental designs; analysis of variance and covariance, factorial and repeated measures, Latin square designs, and tests of trends.

207. Multivariate Analysis of Correlational Data

(4) III. Simonton, Waller

Lecture—4 hours. Prerequisite: course 105 or 205. Because the techniques are implemented using statistical software, prior experience with computers is strongly recommended. Competence in basic algebra is assumed. Application of multiple regression, path analysis, factor analysis, and related methods to infer causal models from correlation matrices.

***208. Physiological Psychology** (4) Chalupa, Henry

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. A conceptual analysis of the contributions of neuroanatomy, neurophysiology and neurochemistry to an understanding of animal and human behavior.

***212. Developmental Psychology** (4) II. Acredolo, Shields

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development.

***220. Topics in the History of Psychology** (4) I.

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) III. 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) III. Emmons, Erickson

Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality.

250. Comparative Psychology (4) I. 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. Murphy

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) II. Chalupa, Owings, Mendoza

Seminar—4 hours.

263A-263B-263C. Topics in Cognitive Psychology

(4) III. Acredolo, Kroll, Long, 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) Natsoulas

Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Theory and research in the psychology of consciousness.

270A-C. Topics in Personality Psychology (4) II.

Elms, Emmons, Erickson

Seminar—4 hours. Prerequisite: graduate student standing in Psychology or consent of instructor. Critical study of a selected area of personality psychology.

290. Seminar (4) II. 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—2-4 hours. Prerequisite: graduate standing in psychology and consent of instructor. Practical experience in teaching. Methods and problems of teaching psychology at the undergraduate and graduate levels; curriculum design and evaluation. Practical experience in the preparation and presentation of material. (Deferred grading only, pending completion of sequence.)

Radiation Oncology

See Medicine, School of

Radiological Sciences

(School of Veterinary Medicine)

Timothy R. O'Brien, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1114 Medical Science-1A
(916-752-0184)

Faculty

Marvin Goldman, Ph.D., Professor

William J. Hornof, D.V.M., M.S., Associate Professor

Philip D. Koblik, D.V.M., M.S., Associate Professor

John S. Mattoon, D.V.M., Associate Clinical Professor

Joe P. Morgan, D.V.M., Vet. med. dr., Professor

Thomas G. Nyland, D.V.M., Professor

Timothy R. O'Brien, D.V.M., Ph.D., Professor

Alain P. Théon, Dr. Med. Vet., Assistant Professor

Part-Time Clinical Faculty

Larry Y. Kerr, D.V.M., Associate Clinical Professor

Sam Silverman, D.V.M., Ph.D., Clinical Professor
James Ticer, D.V.M., Ph.D., Associate Clinical Professor

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 alternate 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 alternate 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 Procedures Rounds (2) I, II, III. The Staff
Discussion—6 hours. Prerequisite: a DVM degree and consent of instructor. Approved for graduate degree credit. Review of selected radiology cases from previous day. Specific radiographic changes and differential diagnosis are discussed, with participants leading the discussions. Special procedures such as angiography; nuclear medicine and ultrasound examinations are reviewed. May be repeated for credit. (S/U grading only.)

409. Known Case Conference (1.5) I, II, III. The Staff
Discussion-demonstration—1.5 hours. Prerequisite: a DVM degree and consent of the instructor. Approved for graduate degree credit. Film review of current VM Teaching Hospital proven cases. Intended for Radiology residents and others with background in diagnostic radiology. May be repeated for credit. (S/U grading only.)

410. Current Topics in Radiological Sciences (1.5)

I, II, III, IV. The Staff

Lecture—1.5 hours. Prerequisite: DVM degree or consent of instructor. Fundamentals of radiological sciences for radiology residents. Topics will include series of in-depth lectures covering the broad spectrum of veterinary radiology/radiological sciences and related alternate imaging modalities. Clinically oriented but also including relevant research material. (S/U grading only.)

Radiology

See Medicine, School of

Range and Wildlands Science

See Range and Wildlands Science, below; and Range Science

Range and Wildlands Science

(College of Agricultural and Environmental Sciences)

The Major Program

Range and wildlands science is the study of the biological and physical components of land resources which are used mostly for grazing domestic livestock, but which also provide wildlife habitats, watersheds, recreation, and open space.

The Program. The major provides background in the biological, physical, and social sciences. Comprehensive study in the plant, animal, soil, and resource sciences supplements the core of range management courses. Integration of the knowledge of a variety of specialized fields is learned as a basis for land management oriented toward the multiple use concept and the maintenance of environmental quality.

Career Alternatives. Range and wildlands science graduates, especially those with some experience, may be employed as consultants, extension specialists, ranch managers, or ranchers. They may also qualify for the position of Range Conservationist in governmental agencies such as the Forest Service, Soil Conservation Service, and the Bureau of Land Management. If career work with such an agency is desired, it is recommended that trainee or apprenticeship experience with that agency be included in the major program of study as an internship. In addition, the training provided by this major should give an excellent background for natural resource management positions.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

UNITS

English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	63-67
Animal science (Animal Science 2)	4
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A, 1B, 8A, 8B).....	16
Computer science (Agricultural Science and Management 21, Engineering 5, or Computer Science Engineering 10)	3
Economic principles (Agricultural Economics 1, Economics 1A, or 1B).....	4-5
Geology (Geology 1-1L).....	4
Mathematics (Mathematics 16A; 16B recommended)	3-6
Physics (Physics 1A, 1B)	6
Soil science (Soil Science 100).....	4
Statistics (Agricultural Science and Management 150).....	4
Breadth/General Education	6-24
Satisfaction of General Education requirement to include two non-introductory courses in Agricultural Economics, Economics, Environmental Studies, or Geography	
Depth Subject Matter	51-56
Plant physiology (Botany 111 or Water Science 104).....	3-4
Plant ecology (Botany 117 or Plant Science 101)	4
Meteorology (Geography 3, Atmospheric Science 105).....	3-4
Soil science, two upper division courses	6-8
Watershed management (Water Science 141).....	3
Animal nutrition (Nutrition 115).....	4
Wildlife ecology or management, one upper	

division course in wildlife and fisheries biology, or zoology.....	3-4
Forage crops (Agronomy 112).....	3
Select units from Range Science:	18
Range and wildland plants (Range Science 100)	
Range ecology (Range Science 133, 134, 135)	
Range field course (Range Science 105)	
Range livestock production (Range Science 160)	
Revegetation of disturbed lands (Range Science 145)	
Range Science 192, 198, 199 (not more than a total of 3 units can be counted)	
Aerial photo interpretation and remote sensing (Geography 106).....	4

Restricted Electives

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

Unrestricted Electives

17-47

Total Units for the Major

180

Major Adviser.

C. A. Raguse (Agronomy and Range Science).

Advising Center for the major is in 137 Hunt Hall.

Graduate Study. See under Ecology Graduate Group.

Range Science

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Agronomy and Range Science.

Major Program. See the major, Range and Wildlands 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, 137 Hunt Hall.

Lower Division Course

92. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge) Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Range and Wildland Plants (4) III. Rice Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Prerequisite: Biological Sciences 1C and junior standing recommended. Systematics, evolution, ecology and use of plants within range and wildland ecosystems. Taxonomy and identification of range and wildland grasses, woody perennials, legumes, and forbs.

105. Field Course (2) III. Menke Lecture—10 hours total; laboratory—30 hours total (given week following end of spring quarter). Prerequisite: course in plant or range ecology. Field studies of rangeland vegetation as a livestock grazing resource and as wildlife habitat. Range management and improvement strategies for enhancing multiple-use carrying capacity: grazing systems, water

developments, seeding of improved species, and prescribed fire. Considered a spring quarter course for preenrollment. Offered in alternate years.

133. Grassland Ecology (3) II. 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 alternate years.

*134. Comparative Ecology of Major Rangeland Systems (3) II.

Menke Lecture—3 hours; one Saturday field trip. Prerequisite: course 100 or the equivalent; general ecology course recommended. Study of vegetation structure, composition, and succession in representative North American rangeland plant communities. Description and comparison of interactions between vegetation and grazing animals on grassland, desert, forested, and tundra rangelands. Discussion of management strategies used in these systems today. Offered in alternate years.

*135. Ecology and Community Structure of Grassland and Savanna Herbivores (3) I.

Demment Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or the equivalent; general ecology course recommended. Feeding ecology of grassland herbivores and its importance in evolution of herbivore communities and social systems. Optimal foraging, interspecific interactions, and primary productivity are considered as factors structuring natural and managed grassland and savanna systems. Offered in alternate years.

***160. Range Livestock Production (3) III.** 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.)

192. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Department Chairperson in charge) Prerequisite: senior standing and consent of instructor. (P/NP grading only.)

Graduate Courses

208. Computer Modeling in Range and Crop Management (3) I. Williams Lecture—3 hours. Prerequisite: one course from Agronomy 205B, Agricultural Science and Management 121, Animal Science 128, or Environmental Studies 128. Development of computer models involving dynamic simulation and optimization modes for range and crop management problems. Modeling philosophy, assumptions, implementation, validation, and experimentation emphasized. Offered in alternate years.

290. Seminar in Range Science (1-2) II. Raguse; III. Demment 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 Chairperson in charge)

299. Research (1-12) I, II, III. The Staff Chairperson in charge) (S/U grading only.)

Religious Studies

(College of Letters and Science)

Walen W. Lai, Ph.D., Program Director

Program Office, 922 Sprout Hall (916-752-9932)

Committee in Charge

William Bossart, Ph.D. (*Philosophy*)

Manfred P. Fleischer, Ph.D. (*History*)

John R. Hall, Ph.D. (*Sociology*)

Lincoln D. Hurst, Ph.D. (*Religious Studies*)

Naomi Janowitz, Ph.D. (*Religious Studies*)

Jay Mechling, Ph.D. (*American Studies*)

Barbara Metcalf, Ph.D., Professor (*History*)

Lynn Roller, Ph.D., (*Classics*)

Faculty

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 great written and oral traditions of the world's religions: Eastern (Hinduism, Buddhism, Taoism, Confucianism), Western (Judaism, Christianity, Islam), ancient (Egypt, Mesopotamia) and modern (contemporary religious groups in the U.S.).

The Program. The religious studies major offers a broad choice of courses including history, philosophy, sociology, anthropology, American studies, classics, and medieval studies. For some students, religious studies is an appropriate second major and might combine well with anything from philosophy to international agricultural development, from history to international relations. The religious studies program has also designed four options for minor programs: religious studies, oriental religions, Judaism, and Christian studies.

Career Alternatives. The emphasis in religious studies courses on developing analytical thinking skills and clear written expression is an asset for many career goals. As a strong liberal arts program, the major can lead to research and/or teaching on all levels, as well as careers in related areas such as the ministry, counseling, social work, and other helping professions. Because the major integrates so many academic areas, it is also an excellent background for graduate programs, especially in the humanities, and for professional schools including law, business, and foreign service.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	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, N. Janowitz, L. Hurst.

Minor Program Requirements:

The following four minor program options and others responsive to students' needs are subject to approval by the major adviser or the Curriculum Committee.

UNITS

Religious Studies20

Religious Studies emphasis

Five courses chosen from Religious Studies 102, 110, 122, 124, 140, 141A or 141B or 141C, 168, 172

Oriental Religions emphasis

Religious Studies 70, 168, 172; and two courses from Religious Studies 110, History 191A, 194A

Judaism emphasis

Religious Studies 23, 122, 124.....12
Two additional courses from Religious Studies 110, History 143, 144

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

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

1. Elementary Classical Hebrew (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Introduction to Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from the Bible. (Students who have successfully completed, with a C- or better, Hebrew 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Classical Hebrew (5) II. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from Hebrew Bible. Continuation of course 1.

3. Elementary Classical Hebrew (5) III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from Hebrew Bible and from post-Biblical Hebrew texts. Continuation of course 2.

Courses in Religious Studies

Lower Division Courses

1. Survey of Religion (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Basic concepts introduced through readings of the primary

religious literature. Discussion of central ideas (creation, history, law, prophecy, suffering, mysticism, asceticism, karma, reincarnation, moksha, etc.); readings from the Bible, Bhagavad Gita, the Koran, selections from Plato and early Buddhist writings. General Education credit: Contemporary Societies/Introductory.

2. Myth, Ritual, and Symbolism (4) I. Lai; III. The Staff

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.

***4. Eastern Religions (4) I.** Lai

Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism, and Taoism from their origins to the present.

10. Introduction to Religious Studies (2) I. Lai

Lecture—2 hours. Topic of importance in more than one religious tradition as an illustration of the problems and methods of religious studies. May be repeated for credit in a different subject area.

21. Old Testament (4) I. The Staff

Lecture-discussion—4 hours. Religion of Ancient Israel from the time of Abraham to the post-exilic period, as contained in the Hebrew Bible. Emphasis on such key Biblical themes and institutions as: monotheism, revelation, law, covenant, holiness, creation, prophecy, priesthood, wisdom, and apocalypse. General Education credit: Civilization and Culture/Introductory.

***23. Basic Judaism (4) I.** The Staff

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) I. 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) I.

Lai/Yip

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 alternate years.

98. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge)

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower-Division Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Upper Division Courses

***100. Study of Religion: Issues and Methods (4) II.** Janowitz

Lecture—3 hours; term paper. Principal issues and methods of Religious Studies and associated fields.

102. Christian Origins (4) I. Hurst

Lecture/discussion—3 hours; term paper. Prerequisite: course 40; course 23 recommended. Beginning of the Christian faith seen in relation to milieu in which it originated. Offered in alternate years.

***110. Religious Biographies (4) I. Lai**
Lecture/discussion—3 hours; term paper. Lives of selected religious leaders representative of different religious temperaments and historical traditions.

115. Mysticism (4) III. The Staff
Lecture/discussion—4 hours. Prerequisite: one lower division Religious Studies course (except 10, 98, or 99). Course intended primarily for Religious Studies majors, with others admitted. Historical and descriptive analysis of selected mystical traditions, and of selected key figures; readings of representative mystical authors.

***122. Studies in Biblical Texts (4) III. Janowitz**
Lecture—3 hours; term paper. Prerequisite: course 21. Study of a book from the Prophets or writings from critical, historical, and religious perspectives. May be repeated once for credit in different subject area.

124. Topics in Judaism (4) III. The Staff
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.

140. Christian Theology (4) III. Hurst
Lecture/discussion—3 hours; term paper. Prerequisite: course 40; course 102 recommended. Historical and systematic introduction to Christian doctrine, with attention to divergent traditions and the problem of orthodoxy and heresy.

***141A. New Testament Literature (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 preparation: 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 preparation: Comparative Literature 1, Integrated Studies 2B, Philosophy 1, or Religious Studies 40.

141C. New Testament Literature (4) II. Hurst
Lecture/discussion—4 hours. Prerequisite: course 40. Life and thought of the early Church as reflected by the Pauline tradition—the letters of Paul. Offered every third year to alternate with 141A, 141B. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: 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 alternate years.

150. Religious Ethics (4) II. Lai
Lecture/discussion—4 hours. Prerequisite: course 4. Study of the religious bases to ethics through concentration on the ethical tracts of one major tradition, or through a comparison of the attitudes of two or more traditions to a common ethical issue. Offered every three years.

168. Hinduism (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 4. Hindu tradition from ancient to modern times. Multiplicity of religious forms within Hinduism with mention of Jainism, Buddhism, and Sikhism and their relation to the mainstream of Hindu religion. Offered in alternate years.

***172. Ch'an (Zen) Buddhism (4) III. 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 meditative techniques.

178A-E. Undergraduate Proseminar in Religion and Culture (2) I. Castelfraco
Lecture/discussion—2 hours. Prerequisite: upper division standing and one course in religious studies or consent of instructor. Individual topics are discussed by lecturers from this campus and elsewhere. Each student writes a term paper in one of these areas. Content alternates among the following: (A) Idioms of Religion, (B) Cultural and Social Context of Religion, (C) Religion and Mind, (D) Religion and Visual Arts, (E) Religion, Music, and Drama. (P/NP grading only.)

189. Senior Colloquium (4) II. The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Primarily for seniors in Religious Studies. Discussion in depth of a problem in religion which requires the methods of several disciplines and is important in the encounter between religions.

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.)

Reproduction

(School of Veterinary Medicine)

George H. Stabenfeldt, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1136 Medical Science I
(916-752-1358)

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., Professor
Ann Trommershausen Bowling, Ph.D., Adjunct Professor

Edward C. Feldman, D.V.M., Professor
John P. Hughes, D.V.M., Professor Emeritus

Bill L. Lasley, Ph.D., Professor in Residence
Irwin K. M. Liu, D.V.M., Ph.D., Professor

James Murray, Ph.D., Associate Professor
(Reproduction, Animal Science)

Joan D. Rowe, D.V.M., Ph.D., Assistant Professor
George H. Stabenfeldt, D.V.M., Ph.D., Professor

Clyde J. Stormont, Ph.D., Professor Emeritus

Part-Time Clinical Faculty

Conrad Ferreira, D.V.M., Assistant Clinical Professor
Walter Guterbock, D.V.M., Assistant Clinical Professor

Bob Harmon, D.V.M., Assistant 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

Terry Lehenbauer, D.V.M., Assistant Clinical Professor
Michael McClosky, D.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
Carlos Risco, D.V.M., Assistant Clinical Professor

Frank N. Walton, D.V.M., Assistant Clinical Professor
John E. Zimmerman, D.V.M., Assistant Clinical Professor

Professor

Courses in Reproduction

Lower Division Course

92. Internship in Veterinary Science (1-4) I, II, III.
The Staff (Stabenfeldt in charge)

Discussion/laboratory—1-4 hours; clinic—3-36 hours; final report. Prerequisite: approval of project prior to period of internship by faculty sponsor. Supervised work experience in Reproduction. (P/NP grading only.)

Upper Division Courses

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.

192. Internship in Veterinary Science (1-12) I, II, III.
The Staff

Discussion/laboratory—1-12 hours; clinic—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work experience in Reproduction. May be repeated for credit. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III.
The Staff (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 alternate years.

***290. Seminar (1) I, II, III. The Staff**

Seminar—1 hour. Discussion of current topics in animal reproduction and medicine, as well as presentation of research findings by graduate students and faculty. May be repeated for credit. (S/U grading only.)

292. Current Topics in Reproduction (1) I, II, III.
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 studies the physical, chemical, and biological features of renewable natural resources, and the economic and social considerations associated with their utilization and management.

The Program. All majors must complete a lower division program that includes chemistry, biology, geology, and other sciences necessary for the study of resource management. After completing this preparation, students progress to an upper division program that requires a general resource sciences course, a resource economics course, and a specified number of units of resource-oriented courses. The resource-oriented courses are selected in consultation with and with the approval of the student's adviser. Advisers can also help students take advantage of the flexibility within the resource sciences major that makes it possible for students to meet their individual academic and career objectives. In addition, the major provides a number of unrestricted elective units that students may use to acquire additional knowledge and skills.

Internships and Career Alternatives. 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 specialists with government agencies, municipalities, and private firms. A significant proportion of graduates undertake further studies leading to advanced degrees in resources, the environment, and related fields.

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
English Composition Requirement	3-12
See College requirement	0-8
Additional English (English 103D, 103E or 104).....	3-4
Preparatory Subject Matter	59-67
Atmospheric science (Geography 3 or Atmospheric Science 60).....	4
Biological sciences (Biological Sciences 1A-1B-1C).....	15
Chemistry (Chemistry 1A-1B).....	10
Computer science (Agricultural Science and Management 21; and Agricultural Science and Management 121, Computer Science Engineering 10 or 30).....	6
Environmental quality (Environmental Toxicology 10 or 101).....	3-4
Geology (Geology 1 or 50).....	3-4
Mathematics (Mathematics 16A-16B).....	6
Physics (Physics 1A-1B, or 5A-5B-5C for quantitative resource management emphasis).....	6-12
Other (additional courses in animal and plant sciences, mathematics and physical sciences with adviser's approval).....	6
Breadth/General Education	6-24
Satisfaction of General Education requirement to include two non-introductory courses in Agricultural Economics, Economics, Environmental Studies, or Geography	
Depth Subject Matter	54-58
Resource Sciences 100.....	4
Soil Science 100.....	4
Water Science 100.....	4
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
Unrestricted electives	19-50
Total Units for the Degree	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 Biology and Management, Environmental Studies, Environmental Toxicology, Geography, Geology, Range Man-	

agement, Soil Science, Water Science, Wildlife and Fisheries Biology, and Zoology.

Major Adviser. J. Stasulat (201 South Hall).

Advising Center for the major is located in 122 Hoagland Hall (916-752-1669).

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 (916-752-1669).

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 preparation: Biological Sciences 10 or Chemistry 10.

3. Energy and the Environment (3) I, II. Flocchini, Lecture—3 hours. Prerequisite: Biological Sciences 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 preparation: 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 preparation: see course 3 above.

3L. Energy, Society and Environment Laboratory (2) I. Flocchini

Discussion—1 hour; laboratory—3 hours; Saturday field trips. Prerequisite: course 3. Field trips to examine nuclear, solar, fossil fuel, hydroelectric, wind, geothermal and cogeneration energy conversion facilities.

10. California: The State (3) I, III. ———

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 preparation: Geography 5-5G.

10G. California: The State (Discussion) (1) I, III.

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 preparation: see course 10.

92. Resource Sciences Internship (1-12) I, II, III.

The Staff (Chairperson in charge) Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge) Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

100. Concepts in Renewable Natural Resources

(4) II. ———

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.

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 preparation: Chemistry 10.

190. Semhar 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) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Chairperson in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates

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

Rhetoric and Communication

(College of Letters and Science)

John L. Vohs, Chairperson of the Department

Department Office, 224 AOB 4 (916-752-1221)

Faculty

Don P. Abbott, Ph.D., Associate Professor
Rina Alcalay, Ph.D., Assistant Professor
Leslie A. Baxter, Ph.D., Professor
Robert A. Bell, Ph.D., Associate Professor
Charles R. Berger, Ph.D., Professor
Carole Blair, Ph.D., Assistant Professor
Michael T. Motley, Ph.D., Professor
James J. Murphy, Ph.D., Professor Emeritus
John L. Vohs, M.A., Senior 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.

The Program. The program of study in rhetoric and communication examines communication from several points of view. Courses are offered which deal with both historical and contemporary perspectives. Other classes focus on language and the symbolic components of messages. Persuasion and argumentation are studied as well. In addition, it is important to examine communication as it occurs in various kinds of social settings, and therefore the department also offers courses in public communication, mass communication, interpersonal communication, and organizational communication.

Career Alternatives. Rhetoric and communication graduates have found careers in such fields as broadcast and print journalism, administration, sales, management, politics and government, education, social work, and public relations. A rhetoric and communication degree is also excellent preparation for law school or other graduate programs.

A.B. Major Requirements:

UNITS

Preparatory Subject Matter8
Rhetoric and Communication 1, 3.....8

Depth Subject Matter44
Rhetoric and Communication 110, 114,
115, 12016

One course from each of the following five groups20

- (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 Communication8

Total Units for the Major52

Letter Grades. Courses to satisfy major requirements should be taken with letter grades, except for variable unit courses.

Major Advisers. J. Brown, J. Marshall.

Advising Office. Room 218, AOB 4

Minor Program Requirements:

UNITS

Rhetoric and Communication24

One course from Rhetoric and Communication 1, 3, 50.....4

A coherent sequence of at least five upper division courses in rhetoric and communication selected with the approval of a minor adviser20

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—1 hour; discussion—3 hours. Practice in the preparation and delivery of speeches with an introduction to rhetorical theory and criticism as applied to public address. (CAN Spch 4)

3. Group Communication (4) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Study of communication in small group situations. Role of communication in various group processes, including leadership and decision-making. Participation in group activities and simulation exercises.

50. Introduction to Argument (4) II, III. The Staff
Lecture—4 hours. Introduction to the rhetoric of argumentation. Emphasis on critical analysis and construction of effective arguments. Study of various standards for evaluating arguments.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

103. Analysis of Message Systems (4) II. Baxter; III. The Staff
Lecture—4 hours. Examination of elements of the communication process, including sources, messages, media, and receivers. Study of the role of these elements as they are influenced by various communicative situations.

105. Semantic and Pragmatic Functions of Language (4) I, III. Motley
Lecture—4 hours. Prerequisite: course 115. The role of language in shaping attitudes and perceptions of self and others. The use and abuse of verbal symbols in communicative situations. Concepts of meaning in discourse.

110. Origins of Rhetoric (4) I, II. Abbott
Lecture-discussion—4 hours. Prerequisite: course in ancient history recommended. Issues in the development of rhetoric from its origins in ancient Greece to A.D. 430. Special attention to works of Plato, Aristotle, Cicero, and Quintilian. Role of grammar and rhetoric in schools of Roman Empire. The Christian rhetoric of Saint Augustine. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: History 4A.

113. Current Humanistic Trends in Rhetorical Theory (4) II. Abbott
Lecture—4 hours. Contemporary developments in traditional rhetorical concepts such as style, meaning, theory of argument, and persuasion.

114. Contemporary Theories of Human Communication (4) I, III. The Staff
Lecture-discussion—4 hours. Rhetoric as a social science, characteristics of social theories, components of theories, development and testing of hypothesis, general models, theories, and research.

115. Empirical Methods in Communication (4) I. Baxter; 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) II, III. Blair
Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

121. Public Address in Western Culture (4) III. The Staff
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) III. The Staff
Lecture—4 hours. Major individuals, movements, and media. Case studies of rhetoric as it has contributed to and is influenced by American culture. Variable content; may be repeated once for credit.

124. Rhetoric of Social Issues (4) II. The Staff
Lecture—4 hours. Overview of nature and function of rhetoric in public controversy. Analysis and evaluation of argumentative discourses and other rhetorical strategies used in the social issues and movements. Study of how rhetoric structures and informs opinions on controversial matters in the public realm.

125. Freedom of Speech (4) II. The Staff
Lecture-discussion—4 hours. Historical developments of and contemporary controversies in freedom of speech. Political dissent, symbolic speech, slander and obscenity. Offered in alternate years.

126. Rhetorical Criticism Practicum (4) II. The Staff
Lecture—4 hours. Prerequisite: course 120. Practice in critical analysis and evaluation of rhetorical events. Application of various critical theories and perspectives in understanding rhetorical situations, genres, ideological positions, effects, and language functions.

130. Group Communication Processes (4) III. Vohs
Lecture—4 hours. Examination of current theories of group formation, goals, structure, and leadership, as they relate to communication processes.

134. Interpersonal Communication (4) III. Motley
Lecture—4 hours. Prerequisite: course 1, 3, or 10, or the equivalent. Communication between two individuals in social and task settings. One-to-one communication, verbal and nonverbal, in developing relationships. Consideration of theory and research on relevant variables such as shyness, self-disclosure, reciprocity, games, and conflict.

135. Nonverbal Communication (4) I. Berger
Lecture—4 hours. Examination of the interaction between nonverbal communication and verbal communication channels in influencing outcomes in interpersonal and mass mediated communication contexts. Underlying functions served by nonverbal communication will also be considered.

136. Organizational Communication (4) I. Vohs
Lecture—4 hours. Examines communication in various organizational situations. Focuses on the use of effective communication strategies for achieving organizational and individual goals. Emphasis is placed on identifying and amending ineffective communication within organizations.

138. Communication and Cognition (4) III. Berger
Seminar—4 hours. Prerequisite: upper division standing. Relationships between communication and cognition. Models of discourse comprehension and production, the influence of language attitudes on social judgements, and the effects of information processing on decision making are explored.

140. Mass Communication and the Public (4) I, III. The Staff
Lecture—4 hours. Current issues in mass communications policy, with emphasis on the broadcast media. Examination of the economic and legal influences on media performance; the role of public broadcasting; the social impact of technological advances, including cable television and communication satellites.

141. Mass Communication Theory and Research (4) III. Alcalay
Lecture—4 hours. Prerequisite: course 115, or the equivalent course in social science research methods. Recent developments in the study of mass communications content and effects, with emphasis on the broadcast media. Special attention to the function of television for selected audiences; children, minorities, the aged.

142A. News Policies and Practices in Television (2) 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) 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. The Staff
Lecture—1 hour; discussion—3 hours; one or two major writing assignments. Analysis, interpretation and evaluation of broadcast media content, employing various critical frameworks including genre studies, mythological and dramaturgical criticism,

*Course not offered this academic year.

linguistic analysis, iconographic criticism, and theories of popular culture.

145. Mass Communication and Social Change (4) I. Alcalay

Lecture—4 hours. Prerequisite: course 115 or the equivalent. Study of communication campaigns as a way to effect social change. Effect on people's behaviors which occur via mass media and interpersonal communication channels. Focus on theory and practice of campaigns in such areas as health, intercultural and international communication.

151. Methods of Advocacy (4) II. The Staff

Lecture—4 hours. Prerequisite: course 51 or consent of instructor. Study and practice of methods involved in the effective advocacy of positions on current controversial issues. Relation of inquiry and explanation to advocacy. Consideration of logical and nonlogical means of persuasion.

152. Theories of Persuasion (4) I. 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 preparation: 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—3-18 hours. Prerequisite: declared major in Rhetoric and Communication and 20 units of upper division Rhetoric and Communication courses. Work-research projects, usually at off-campus sites under departmental supervision. May be repeated for credit up to 12 units. Units do not count toward major requirement. (P/NP grading only.)

194H. Senior Honors Thesis (4) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour; individual tutoring on research project—3 hours. Prerequisite: senior standing and approval by Honors Committee. Directed reading, research, and writing culminating in the preparation of honors thesis under direction of faculty adviser.

197T. Tutoring in Rhetoric and Communication (2-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing with major in Rhetoric and Communication and consent of Department Chairperson. Tutoring in undergraduate Rhetoric and Communication courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to six units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

Seniors may take graduate courses with consent of instructor.

210. Contemporary Rhetorical Theory (4) 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. Perspectives on Rhetorical and Communication Theory (4) I. Berger

Seminar—4 hours. Prerequisite: graduate standing in Rhetoric and Communication. Nature and role of

paradigms and theories in developing knowledge about communication. Examination of current theoretical perspectives in rhetoric and communication.

214. Mass Communication Theory and Research (4) I. Alcalay

Seminar—4 hours. Prerequisite: course 220 or the equivalent. Examines the basic theories, models, and assumptions of mass communication. Reviews the current state of this discipline and major research developments. Special emphasis on research regarding media and violence, women and minorities, political communication, and new technologies.

215. Mass Communication and Social Change (4) II. Alcalay

Seminar—4 hours. Prerequisite: course 220 and 214, or the equivalent. To gain an understanding of current theories and concepts in persuasion and mass communication. To explore how principles of persuasion are used in communication campaigns. To acquire skills in the planning, implementation, and evaluation of campaigns. Offered in alternate years.

220. Empirical Methods in Communication (4) II. Motley

Lecture—4 hours. Prerequisite: course 115 or consent of instructor. Introduction to the use of experimental and descriptive research methods in communication research. Topics include survey research, interviewing, experimental and quasi-experimental design, and statistics.

222. Practicum in Rhetorical Criticism (4) I. Blair
Seminar—4 hours. Prerequisite: course 120, an equivalent course in criticism, or consent of instructor. Analysis of selected persuasive messages. Particular attention to the rhetorical situation and to elements in the rhetorical process.

240. Advocacy in Contemporary Society (4) III. The Staff

Seminar—4 hours. Prerequisite: course 151 or the equivalent. Rhetorical and communication theories of argumentation and advocative stance. Analysis of the persuasive impact of argumentation occurring in current public controversies. Offered in alternate years.

242. Proseminar in Symbolic Behavior (4) I. Baxter
Seminar—4 hours. Prerequisite: course 220. Examination of language and/or other symbolic codes in communication. Investigated phenomena may include stylistic variation, speech acts, cognitive processing, communication rules, and audience effects. Offered in alternate years.

243. Persuasion Theory (4) III. Bell

Lecture/seminar—4 hours. Prerequisite: course 152, 212, or consent of instructor. Major scientific theories of persuasion. Research programs related to persuasion theories.

244. Organizational Communication (4) II. Vohs
Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Theory and research on communication processes in organizations.

245. Classical Rhetorical Theory (4) III. Abbott
Lecture-seminar—4 hours. Prerequisite: course 110 or the equivalent. Recurrent issues in Greek and Roman rhetorical theory, particularly those in the works of Plato, Aristotle, Cicero, and Quintilian. Special attention to problems of invention and style. Frequent seminar reports involving propositions derived from readings.

***246. Perspectives on Relational Communication (4)** III. Baxter

Seminar—4 hours. Prerequisite: course 212. Critical survey of the current state of inquiry on communication in personal relationships, i.e., friendship, romantic, and marital relationships. Issues examined include the role of communication in constructing, maintaining, and dissolving relationships.

247. Theories of Rhetorical Criticism (4) II. Blair
Discussion/seminar—4 hours. Prerequisite: one course in rhetorical theory and/or criticism. Historical evolution of critical standards from the pre-Socratics to the twentieth century. Emphasis on contemporary questions of textuality, objectivity, intentionality, and justification.

248. Media Criticism (4) III. The Staff

Seminar—4 hours. Prerequisite: a course in criticism. Examines broadcast, print, and visual media by means of rhetorical, psychological, semiological, sociological, and cultural studies and perspectives. Comparison of media and of critical theory scope in understanding media messages. Offered in alternate years.

249. Interpersonal Communication Theory (4) II. Baxter

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)**

Discussion/seminar—4 hours. Selected topics in rhetoric and communication. May be repeated for credit when a different topic is studied.

251. Special Topics in Interpersonal Communication (4) III. Berger

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Selected topics in interpersonal communication. May be repeated for credit when topic changes.

***252. Special Topics in Mass Communication (4)**

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Selected topics in mass communication theory and research. May be repeated for credit when topic changes.

***253. Negotiation (4)** III. Vohs

Seminar—4 hours. Prerequisite: graduate standing and consent of instructor. Theory and research on negotiating. Offered in alternate years.

***255. Medieval and Renaissance Rhetorical Theory (4)**

Seminar—4 hours. Prerequisite: course in ancient Greek and Roman rhetoric. Rhetoric theory from time of Saint Augustine (A.D. 430) to end of Renaissance (A.D. 1700). Three medieval rhetorical genres. Rise of universities. Effect of Renaissance humanism, printing, and science. Influence of major theorists such as Erasmus, Melancthon, Ramus, and Bacon.

***256. Early Modern Rhetorical Theory (4)**

Seminar—4 hours. Prerequisite: course in Classical or Renaissance rhetoric. Development of English and continental theories of rhetoric, 1700-1900. Emphasis upon the works of Priestley, Reid, Campbell, Blair, and Whately. Special attention to psychological, epistemological, and belletristic elements. Offered in alternate years.

***260. Communication Applications (2-4)** I, II, III.

The Staff (Chairperson in charge)
Discussion—1 hour; supervised field work—3-9 hours. Prerequisite: course 220. Field work in communication. Organization and implementation of a research project for a specific application of a communication program. May be repeated once for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Lecture—3 hours.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299R. Thesis Research (1-12) I, II, III. The Staff (Chairperson in charge)

Independent study—3-36 hours. Prerequisite: graduate standing in Rhetoric and Communication. (S/U grading only.)

Professional Course

390. Teaching Communication Skills at the College Level (4) I. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: graduate standing or consent of instructor. Problems and techniques of teaching basic communication skills courses at the college level. (S/U grading only.)

Russian

(College of Letters and Science)

James Gallant, Ph.D., Program Director

Program Office, 422 Sproul Hall (916-752-4171)

Committee in Charge

Robert O. Crummey, Ph.D. (*History*)

James Gallant, Ph.D. (*Russian*)

Lawrence J. Grant, M.A. (*Russian*)

Harriet Murav, Ph.D. (*Russian*)

Daniel Rancour-Laferriere, Ph.D. (*Russian*)

Faculty

Yuri Druzhnikov, Ph.D., Assistant Professor

James Gallant, Ph.D., Lecturer

Lawrence J. Grant, M.A., Lecturer

Harriet Murav, Ph.D. Assistant Professor

Daniel Rancour-Laferriere, Ph.D., Professor

Valerie A. Tumins, Ph.D., Professor Emeritus

The Major Program

The Russian major exposes students to a culture rich in art, language, and literature and presents an important skill needed to enter the fields of foreign affairs, world politics, and international trade, or to begin graduate work in literature, history, and international relations.

The Program. The department offers a choice of three emphases. The common basis for the first two is extensive training in the Russian language. The *Russian Literature* emphasis concentrates on the evaluation of Russian literary movements and cultural trends. The second area of study, the *Russian Language* emphasis, focuses on linguistics and practical language skills. The third area, the *Russian Area Studies* emphasis, provides an interdisciplinary program offering training in the Russian language and literature and in the historical development and contemporary social, political, and economic conditions of the Soviet Union.

Internships, Study Abroad, and Career Alternatives. Students who have completed two years of Russian language study can participate in the Education Abroad Program at the Leningrad Herzen Pedagogical Institute. Many of our students also participate in summer, semester, and year programs, sponsored by CIEE and ACTR, in Leningrad and Moscow. Russian majors may participate in internships where they can serve as translators and interpreters for schools and business firms throughout Northern California. Upon graduation, many Russian majors enter the business world or enter graduate programs in Slavic studies and international relations. The department encourages students to supplement their Russian studies with courses in related fields such as international relations, political science, computer science, or economics in order to maximize their career possibilities.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-38
Literature/Language emphasis	
Russian 1 through 6 (or the equivalent)	0-30
Russian 41, 42	8
Recommended, Linguistics 1.	
Area Studies emphasis	
Russian 1 through 6 or the equivalent	0-30
Russian 41 or 42 or the equivalent course in basic literary analysis	4
Depth Subject Matter	36-44
Russian Literature emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 103 or 105	4
Russian 121, 123	8
Russian 127 or 128	4
Additional upper division units chosen in consultation with adviser	8

Russian Language emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 105	4
Russian 103 or 104	4
Russian 160	4
Additional upper division units chosen in consultation with adviser	12
Russian Area Studies emphasis	
Russian 105	4
Russian 101A, 103, or 104	4
Russian 150	4
Three literature courses to be chosen from Russian 121, 123, 126, 128, 140, 141	12
History 137B, 137C	8
Three courses, with no more than two in one area, to be chosen from the following two areas: (a) History 137A, 138, 102F; (b) Social sciences—Political Science 136, Economics 117, Geography 124	12
(To meet special interest course needs, a student should obtain written approval from an adviser.)	
Total Units for the Major	44-78

Major Adviser. 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	20
Russian 6	4
Russian 101A, 101B, 101C	12
One course from Russian 102, 103, 104, 105, 160	4
Russian Literature emphasis	20
Russian 41 or 42	4
Russian 121, 123; and 140 or 141	12
One course from Russian 120, 126, 150, 154	4
Russian Area Studies emphasis	20
Three courses to be chosen from Russian 121, 123, 126, 150, 154 (Russian 41 or 42 or the equivalent course in basic literary analysis required)	12
One course from History 137B, 137C	4
One course from Political Science 136, Economics 117, Geography 124	4

Teaching Credential Subject Representative. J. Gallant. See also under Teacher Education Program.

Graduate Study. The Department offers two programs of study (one with emphasis on language and culture, the other with emphasis on literature) leading to the M.A. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Graduate Adviser. Y. Druzhnikov.

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) I, 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.

41. Survey of Nineteenth-Century Russian Literature (in English) (4) I. Murav

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 alternate years.

42. Survey of Twentieth-Century Russian Literature (in English) (4) II. Rancour-Laferriere

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 alternate years.

44. Children's Literature in Russia (4) III. Druzhnikov. Lecture—3 hours; term paper. Knowledge of Russian not required. History and theory of children's literature, with special reference to Russian and Soviet examples. Analysis of genres, technique, and folklore elements, contrasted with those of the West. Students will write their own literature for children. General Education credit: Civilization and Culture/Introductory.

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. Gallant. 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. Gallant. Lecture—2 hours; discussion—1 hour; oral reports. Prerequisite: course 101A. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

101C. Advanced Russian (4) III. Gallant. Lecture—2 hours; discussion—1 hour; oral reports. Continuation of course 101B. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

***102. Russian Composition (4) II.** The Staff. Discussion—3 hours; individual tutorial with instructor. Prerequisite: course 6. Practice in writing Rus-

*Course not offered this academic year.

sian. 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 alternate years.

103. Literary Translation (4) III. Murav
Discussion—3 hours. Prerequisite: course 101C. Translation of Russian literary texts into stylistically equivalent idiomatic English. Offered in alternate years.

***104. Scientific Translation (4) III.** Rancour-Laferriere
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 alternate years.

105. Advanced Russian Conversation (4) II. Druzhnikov
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 alternate years.

***120. Medieval Literature and Eighteenth-Century Classicism (In English) (4) III.** The Staff
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 alternate years.

***121. Nineteenth-Century Russian Prose (In English) (4) II.** Rancour-Laferriere
Lecture—3 hours; term paper. Development of prose from Pushkin and Gogol, through Dostoevsky and Tolstoy, to Maxim Gorky. Other writers are selected sequentially: Turgenev, Goncharov, Pisemsky, Saltykov, Chekhov. Romanticism, the Natural School, critical realism, and psychological realism are covered. Offered in alternate years.

123. Twentieth-Century Russian Prose (In English) (4) II. The Staff
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 alternate years.

***126. The Russian Theater (In English) (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in alternate years.

***127. Nineteenth-Century Russian Poetry (4) I.** Rancour-Laferriere
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 alternate years.

***128. Twentieth-Century Russian Poetry (4) I.** Rancour-Laferriere
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to principles of Russian versification followed by historical and poetic analysis of the following figures: Brjusov, Blok, Akhmatova, Mandelstam, Esenin, Mayakovsky, Khlebnikov, Pasternak, Evtushenko, Voznesensky, and Brodsky. Conducted in Russian. Offered in alternate years.

130. Contemporary Soviet Culture (4) III. Murav
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. General Education credit: Civilization and Culture/Non-Introductory.

ry. Recommended GE preparation: any course from GE Literature Preparation List.

***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 preparation: any course from the GE Literature Preparation List, or History 3 or 4C. Offered in alternate years.

***132. Nature and Culture in the Soviet Union (4) I.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: any introductory course in environmental studies. Presents a history of the Soviet environmental movement from the 1920s to the present, showing the influence of Stalinism on environmental ethics; concepts of society and nature in Soviet literature and film; and international implications of Soviet environmental policy. No knowledge of Russian required. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

***140. Dostoevsky (In English) (4) I.** Murav
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 alternate years.

141. Tolstoy (In English) (4) I. Murav
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 alternate years.

***150. Russian Culture (4) III.** The 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 alternate years.

151. Soviet Writers and Censorship (4) II. Druzhnikov
Lecture—3 hours; discussion—1 hour. Prerequisite: any introductory course from the GE Literature Preparation List or consent of instructor. Literature and censorship in the Soviet Union. Personal responsibility of the author vs. conformism to state morality, Soviet myths and Soviet realities. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: any course from the GE Literature Preparation List.

154. Russian Folklore (4) III. Rancour-Laferriere
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 alternate 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 alternate years.

166. Representations of Sexuality in Russian Literature (4) I. Rancour-Laferriere
Lecture—3 hours; term paper. Prerequisite: Women's Studies 50 or introductory psychology. Sexuality in Russian oral and written literature from a dual, feminist-psychoanalytic perspective. Monogamy, free love, sexism, homosexuality, incest, androgyny, and others as depicted by such writers as Pushkin, Gogol, Tolstoy, Dostoevsky, Akhmatova, Blok, Tolstala, and others. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Women's Studies 50 or introductory psychology.

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 alternate 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 alternate years.

***204. Descriptive Russian Grammar (4) III.** Gallant
Lecture—3 hours; reading projects—1 hour. Introduction to modern Russian phonology and morphology. Offered in alternate years.

***210A. Style and Syntax (4) I.** Druzhnikov
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

***210B. Style and Syntax (4) II.** Druzhnikov
Discussion—3 hours; reading projects—1 hour. Prerequisite: course 210A or consent of instructor. Examination of stylistic differences between spoken and written Russian.

***210C. Russian Style and Syntax (4) III.** Druzhnikov
Discussion—3 hours; term paper. Prerequisite: course 210B or consent of instructor. Students present formal papers and talks on political, economical, social, and cultural topics, lead and participate in discussions. Conducted in Russian.

***220. Old Russian Literature (4) II.** The Staff
Seminar—3 hours. Advanced study of intellectual movements and literary styles of works such as *The Song of Igor's Campaign*, *Zadonschina*, Epifany's *Lives*, Ivan IV's cycle of epistles. May be repeated for credit when different topics are studied. Offered in alternate years.

***221. Eighteenth-Century Russian Literature (4) II.** The Staff
Seminar—3 hours. Advanced study of literary movements and styles in prose or poetry. The works of writers such as Kantemir, Lomonosov, Sumarokov, Radishchev and Karamzin will be analyzed. May be repeated for credit when different topics are studied. Offered in alternate years.

***222. Nineteenth-Century Russian Literature (4) I.** Rancour-Laferriere, Murav
Seminar—3 hours. Advanced study of the works of one or several writers or movements of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in alternate years.

***223. Early Twentieth-Century Russian Literature (4) I.** Rancour-Laferriere
Seminar—3 hours. Advanced study of one or more of the modernist movements in Russian literature, including Symbolism, Acmeism, and Futurism. May be repeated for credit when different topics studied. Offered in alternate years.

***224. Soviet Russian Literature (4) III.** Rancour-Laferriere, Druzhnikov
Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis

on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit when different topics are studied. Offered in alternate years.

230. Pushkin Studies (4) I. Druzhnikov
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: graduate standing or consent of instructor. The life and works of Pushkin; the history of Pushkin studies up to and including present-day controversies about Pushkin. Evaluations of Pushkin by both Russian and Western scholars. Images of Pushkin and the official myths that surround him. Conducted in Russian; readings in Russian and English.

***298. Group Study (1-5) I, II, III.** The Staff (Director in charge)

***299. Research (1-12) I, II, III.** The Staff (Director in charge)
(S/U grading only.)

Professional Course

***300. The Teaching of Russian (2) I.** 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), 422
Sproul Hall (916-752-2114)

Faculty

Fritz Sammern-Frankenegg, Ph.D., Lecturer
(Swedish, German)

Courses in Scandinavian

Upper Division Courses

110. Masterworks of Scandinavian Literature in Translation (4) I. Sammern-Frankenegg
Lecture—3 hours; written reports. Readings in English translation from Icelandic Saga to the present, treating such major authors as Ludvig Holberg, Søren 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-Frankenegg
Lecture—3 hours; term paper. Swedish films studied as narratives in the cinematic medium and compared to their literary sources. Offered in alternate years.

Courses in Swedish

Lower Division Courses

1. Elementary Swedish (5) I. Sammern-Frankenegg
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-Frankenegg
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-Frankenegg
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-Frankenegg
Discussion—3 hours; weekly reports. Prerequisite: course 3. Review of grammatical principles by means of written exercises. Reading and discussion of modern Swedish literary and nonliterary texts.

***6A. Spoken Swedish (2) I.** Sammern-Frankenegg
Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. (P/NP grading only.)

***6B. Spoken Swedish (2) II.** Sammern-Frankenegg
Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. (P/NP grading only.)

98. Directed Group Study (1-3) I, II, III. Sammern-Frankenegg
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-3) I, II, III. Sammern-Frankenegg
Prerequisite: consent of instructor. (P/NP grading only.)

Sociology

(College of Letters and Science)
Lawrence E. Cohen, Ph.D., Chairperson of the
Department
Department Office, 109 Young Hall (916-752-0782)
Advising Office, 113 Young Hall (916-752-0786)

Faculty

Nicole W. Biggart, Ph.D., Associate Professor
(Sociology, Management)
Fred Block, Ph.D., Professor
Lawrence E. Cohen, Ph.D., Professor
James C. Cramer, Ph.D., Associate Professor
Diane H. Felmlee, Ph.D., Associate Professor
Jack A. Goldstone, Ph.D., Professor
Bruce M. Hackett, Ph.D., Associate Professor
John R. Hall, Ph.D., Professor
Gary G. Hamilton, Ph.D., Professor
Mary Jackman, Ph.D., Professor
Carole E. Joffe, Ph.D., Professor (Sociology, Women's Studies)
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., Associate Professor
Belinda Robnett, Ph.D., Assistant Professor
Julius A. Roth, Ph.D., Professor
John F. Scott, Ph.D., Professor
Judith Stacey, Ph.D., Professor (Sociology, Women's Studies)
John T. Walton, Ph.D., Professor (Anthropology, Sociology)
Diane L. Wolf, Ph.D., Assistant 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 Program. The Department of Sociology offers two major programs, Sociology and Sociology-Organizational Studies.

Students selecting the Sociology major may choose from four options offered within this major. The *General* Sociology emphasis allows students to obtain a broad understanding of the concepts, methods, and theories of sociology. This option is designed for students desiring a solid liberal arts education as well

as those interested in graduate work in the social sciences. Students with a special interest in the areas of *Law and Society* or *Social Services* may choose a more specialized program of courses and practical experience within the sociology major. These options are designed to prepare students for careers in such areas as law, corrections, social work or counseling. The *Comparative Studies and World Development* emphasis provides a sociological perspective on social and economic changes throughout the world, with a stress on relationships between "developed" and "underdeveloped" societies. It can prepare students for graduate training leading to careers in international fields. Students are encouraged to consider the Education Abroad Program for their junior year, especially one in a developing country.

The Sociology-Organizational Studies major is designed to develop a broad understanding of the political, social, and economic organizations that comprise modern society. This major emphasizes a sociological perspective, but incorporates a multidisciplinary field of study. The major introduces students to a range of theories and methods that social scientists use in the analysis of organizations. Majors in Sociology-Organizational Studies will be prepared for a variety of career options, particularly in the field of management. The major has been specifically designed to meet entry requirements for programs of professional training leading to a Masters degree in public or private management, and may also lead to further study in any of the disciplinary areas incorporated in the major.

The Department of Sociology sponsors the interdisciplinary minor in War-Peace Studies. Composed of courses from several departments, it is not a minor in Sociology and is entered in transcripts as "War-Peace Studies." For requirements and other details see War-Peace Studies.

SOCIOLOGY MAJOR

A.B. Degree Requirements:

General emphasis:	UNITS
Preparatory Subject Matter	24-25
Sociology 1, 2, or 3; 46A, 46B (or the equivalent)	12-13
Select units from Anthropology 2, 4	4
Select units from History 3, 4A, 4B, 4C, 8, 9A, 9B, 10, 15, 17A, 17B	4
Select units from Philosophy 1, 5, 14, Political Science 4	4
Depth Subject Matter	44
Sociology 126, 140, 165A, 165B, 170, 180A	24
Select two courses each from two of the following seven clusters and one additional course from a third cluster	20
Family, Gender, and Social Interaction Sociology 122, 127, 131, 132, 143B	
Law and Social Services Sociology 120, 150, 152, 154, 155, 158, 185	
Social Conflict and Change Sociology 102, 123, 141, 142, 143A, 145, 147, 148, 156, 157, 180B, 181, 182	
Race and Ethnicity Sociology 110, 128, 129, 130, 134, 169	
Power and Politics Sociology 118, 119, 133, 139, 144, 159	
Knowledge and Communication Sociology 124, 125, 146, 173, 175, 176	
Methodology Sociology 103, 106, 169, 192	
Total Units for the Major	68-69
(General emphasis)	
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 Matter40

Sociology 155.....4
Select units from Sociology 120, 150, 152.....8

Select units from Sociology 118, 122, 123, 130, 131, 139, 140, 141, 143A or 143B, 156, 165B, 180A or 180B, 185.....12

At least 16 additional units in upper division sociology courses to achieve a minimum of 40 units.....16

Total Units for the Major65-67

(Law and Society option)

Social Services option:

UNITS

Preparatory Subject Matter28

Sociology 2, 3, 46A, 46B (or the equivalent).....16
Psychology 1.....4

Select units from Afro-American Studies 10, 15; Asian American Studies 1, 2; Chicano Studies 10, 20; Native American Studies 10, 70.....8

Depth Subject Matter44

Sociology 131, 140, 185.....12
Select units from upper division human psychology.....4

Select seven courses distributed as specified.....28

Social Issues

Sociology 102, 119, 120, 122, 124, 139, 143A, 144, 146, 150, 152, 154, 155, 170.....8

Social Interaction

Sociology 126, 127, 128, 143B, 148, 157.....4

Race and Ethnicity

Afro-American Studies 100; Applied Behavioral Sciences 176; Asian American Studies 110, 111, 150; Native American Studies 112, 124; Sociology 110, 129, 130, 134.....4

Gender

Sociology 132, 133.....4

Organizational Behavior

Sociology 158, 180A, 180B, 181, 182, 183.....4

Methodology

Sociology 103, 106, 169, 192.....4

Total Units for the Major72

(Social Services option)

Comparative Studies and World Development option:

UNITS

Preparatory Subject Matter30-57

Sociology 1, 46A, 46B.....13
Economics 1A, 1B.....10
Anthropology 2.....4

At least 4 units from Geography 2-2G, History 10, Political Science 2.....4

Course work in language instruction in modern foreign language equivalent to 26 units at UCD.....26

Depth Subject Matter48

Sociology 141, 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) *Africa/Middle East*: Anthropology 140A, 140B, 142, Economics 175, Geography 125A, 125B, History 115A, 115B, 115C, 116, Political Science 134, 146

(b) *Latin America/Pacific*: Anthropology 144, 147, Geography 122A, 122B, History 161A, 161B, 162, 165, Spanish 135, 136

(c) *Asia*: Anthropology 149, Economics 171, 172, 173, Geography 126, 127, History 193, 194A, 194B, 194C, Political Science 138, 148A, 148B, Religious Studies 168, 172, Sociology 147

Total Units for the Major79-105

(Comparative Studies and World Development)

SOCIOLOGY—ORGANIZATIONAL STUDIES**A.B. Degree Requirements:**

UNITS

Preparatory Subject Matter22

Sociology 1, 46A.....9
Economics 1A, 1B.....10
Mathematics 16A.....3

Recommended: Engineering-Computer Science 10, Mathematics 16B, 16C

Depth Subject Matter44-45

Sociology 180A, 180B.....8

Sociology 103.....4

Sociology 106 or the equivalent.....4
(Note prerequisite: Sociology 46B or Statistics 13)

Economics 100 or Agricultural Economics 100A.....4-5

Units from Applied Behavioral Sciences 162, 163, 164, 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, 181, 183, 192.....8

Total Units for the Major66-67

Major Advisers. Consult the Departmental Advising Office, 113 Young Hall.

Honors Program. An Honors Program is available to Sociology and Sociology-Organizational Studies majors who have demonstrated excellence in their field of study. To be eligible for the program, students must have a grade-point average of 3.5 in the major and the recommendation of a faculty sponsor familiar with their work. In addition to meeting the standard major requirements, the honors student writes an honors thesis and participates in a 2-quarter honors seminar (course 194HAB). Successful completion of the Honors Program enables the student to graduate with Highest Honors or with High Honors.

Minor Program Requirements:

The Department of Sociology has established the following minor programs of study.

UNITS

Sociology-General20

Select units from Sociology 126, 140, 165A, 165B, 180A or 180B.....8

Additional upper division units in Sociology.....12

Sociology—Organizational Studies20

Sociology 180A and 180B.....8

Select units from Agricultural Economics 112, American Studies 125, Applied Behavioral Sciences 162, 163, 164, Economics 100, Political Science 180, 181, 183, 187, 188, Psychology 183, Rhetoric and Communication 134, 136.....8

Select units from Anthropology 122, History 174A, 179, 187A, 187B, 194D, Sociology 118, 139, 141, 156, 159, 175, 181, 183.....4

Sociology—Social Service20

Sociology 185, plus 4 units selected from Sociology 131, 134, 140, 152.....8

Four units from Sociology 143A or 143B, 156, 165B, 180A or 180B, 181.....4

Additional upper division units selected from Sociology 110, 122, 127, 129, 132, 154.....8

Sociology—Law and Society20

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, 134, 139, 141.....8

Minor Advisers. Consult the departmental Advising Office, 113 Young Hall.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in sociology. Further information and applications regarding graduate study may be obtained at the department office.

Graduate Advisers. Consult the Graduate Administrative Assistant, 113 Young Hall.

Courses in Sociology**Lower Division Courses****1. Introduction to Sociology (5) I. Hackett; 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)

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) I. J. Lofland, Robnett

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)

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 preparation: Sociology 2 or Anthropology 2.

46A. Introduction to Social Research (4) I, III. 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. Felmlee

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

(Chairperson in charge)
Prerequisite: consent of instructor. Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III.

(Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

- 103. Evaluation Research Methods (4) II.** The Staff
Lecture—3 hours; discussion—1 hour or field
research (decided by instructor each time course
offered). Prerequisite: course 46A and 46B, or Statis-
tics 13 or the equivalent. Surveys applications of
research methods to the evaluation of social pro-
grams, primarily emphasizing methodological
issues, e.g., research design and data collection;
uses of evaluation research are also discussed and
placed in theoretical context. Participation in an eval-
uation project.
- 106. Intermediate Social Statistics (4) I.** Cramer
Lecture—3 hours; discussion—1 hour. Prerequisite:
course 46B or Statistics 13 or the equivalent. Inter-
mediate 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.** Jor-
gensen
Seminar—3 hours; to be arranged—1 hour.
Research and analysis using basic concepts of soci-
ology, social organization, culture, socialization,
stratification in application to specific problems. May
be repeated for credit with consent of instructor. Lim-
ited enrollment.
- 110. Sociology of Chicano Culture (4) II.** Pesquera
Lecture—3 hours; term paper. The Chicano experi-
ence in the American society and economy viewed
from theoretical perspectives. Immigration, history of
integration of Chicano labor into American class struc-
ture, education inequality, ethnicity, the family, and
Chicano politics. Offered in alternate years.
- 118. Political Sociology (4) I.** Jackman
Lecture—3 hours; discussion—1 hour or term paper
or research project. Relation of social cleavages and
social cohesion to the functioning of political institu-
tions; the social bases of local and national power
structures; social sources of political movement,
analysis of concepts of alienation, revolution, ideol-
ogy, ruling class, and elite.
- 119. Peace Institutions (4) II.** J. Lofland
Lecture—3 hours; discussion—1 hour or term paper
or project. Survey and analysis of private and public
groups and organizations working for world peace
by means other than preparing for war or supporting
such preparations. Particular focus on peace institu-
tions in the political, economic, scientific, religious,
and educational realms.
- 120. Deviation and Society (4) I.** Melossi
Lecture—3 hours; discussion—1 hour or term paper
or research project. Theory and studies of deviation
in relation to societal reaction, group processes and
social roles. Stigma and incapacity; cosmetic defect.
Deviation theory applied to selected crimes, prostitu-
tion, drugs, alcohol use, and mental disorders. Cre-
ativity 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 emer-
gence 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
(instructor's option). Education and the social struc-
ture. Class size, curriculum, and economies of scale.
Relations between families and schools in socializa-
tion; familial ascription and educational achievement.
Education and industrialization. Organizational and
occupational structure of schools. Discussion of
selected controversies.
- 126. Social Interaction (4) III.** Robnett
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 mean-
ings, situations, personal identity and human rela-
tionships. Particular attention to the work of Erving
Goffman and to principles of field observation and
qualitative analysis.
- 127. Sociology of Death (4) III.** L. Lofland
Lecture—3 hours; discussion—1 hour or term paper
or project (instructor's option). Prerequisite: course 1
or the equivalent. Overview of attitudes toward,
structural effects of, and methods of coping with,
death and death-related behaviors. Particular atten-
tion to social psychological aspects of death and
dying, to death occupations and to death rituals in
various cultures.
- 128. Interracial Interpersonal Dynamics (4) I.** Jor-
gensen
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 strati-
fication 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)**
III. Robnett
Lecture—3 hours; discussion, research, or term
paper (instructor's option). Survey of historical and
contemporary theoretical sociological perspectives
on the Black experience in United States. Emphasis
on comparisons of Black sociological perspectives
and mainstream perspectives of specific sociologists.
- 130. Race Relations (4) 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.** Stacey
Lecture—3 hours; discussion—1 hour. Contempo-
rary family life in historical and cross-cultural per-
spective. How different family forms arose, their sig-
nificance today and prospects for further family
change. Attention to power relations within and
beyond the family and to the social implications of
family transformation.
- 132. The Sociology of Gender (4) I.** Felmløe; II.
Robnett
Lecture—3 hours; discussion—1 hour. Analysis of
biological, psychological, cultural and structural con-
ditions underlying the status and roles of men and
women in contemporary society, drawing on a histor-
ical and comparative perspective. Offered in alter-
nate years.
- *133. Sexual Stratification and Politics (4)** Stacey
Lecture—3 hours; discussion—1 hour. Prerequisite:
course 132 or the equivalent or consent of instructor.
Analysis of origins, dynamics, and social implica-
tions of sexual stratification. Examination of classical
and contemporary theorists such as Engels, Freud,
J.S. Mill, de Beauvoir, Juliet Mitchell, D. Dinnerstein.
Attention to selected issues in social movements for
and against sexual equality.
- 134. Sociology of Racial Ethnic Families (4) III.**
Pesquera
Lecture—3 hours; discussion—1 hour or term paper.
Asian American, Black, Chicano, and Native Ameri-
can family life in comparative historical perspective.
Family structure and gender roles are considered in
relation to socio-historical dynamics. Offered in alter-
nate years.
- 139. Corporations and Society (4) I.** Block
Lecture—3 hours; research project. The study of the
history and power of the modern corporation; corpo-
rate organization; politics, the state, and the corpo-
ration; labor unions and the labor process; com-
petition, regulation and international markets; the
multinational and conglomerate corporation; and
mass markets and consumerism.
- 140. Social Stratification (4) III.** Hackett
Lecture—3 hours; discussion—1 hour or term paper
or research project (instructor's option). Systems of
social ranking, theories of stratification; power, pres-
tige, culture, and styles of life of various social class-
es; social mobility and its consequences for social
structure.
- 141. Industrialization and Social Change (4)**
Hackett
Lecture—3 hours; discussion—1 hour or term paper
or research project. Selected technological and
social factors. Preconditions of economic develop-
ment and industrialization. Social, political, and
cultural issues at various levels of economic develop-
ment. Major historical differences and major cur-
rent trends. Emphasis either on highly industrialized
countries or on less developed countries.
- *142. Sociology of Transportation (4)** Scott
Lecture—3 hours; discussion—1 hour or term paper
or research project. Sociological factors in trans-
portation. Consequences of transport mode develop-
ment on social organization, sociological
influences in transport mode choice. Transportation
issues in public policy.
- *143A. Urban Society (4) I.** L. Lofland
Lecture—3 hours; discussion—1 hour or term paper
or project (instructor's option). Prerequisite: course 1
or the equivalent. Theories of city origins. Analysis of
the historic process of urbanization and of varying
city types. Comparison of American and European
experience of metropolization, counterurbaniza-
tion, and neighborhood change. Consideration of
competing theories of urban growth and change and
competing visions of the urban future. Offered in
alternate years.
- *143B. Sociology of City Life (4) I.** L. Lofland
Lecture—3 hours; discussion—1 hour or term paper
or project (instructor's option). Prerequisite: course 1
or the equivalent; course 143A recommended. Criti-
cal dissection of the "loss of community" issue. Anal-
ysis of the organization of primary ties in the city,
of the culture of urban public life and of the learning
of city skills. Offered in alternate years.
- *144. Agriculture and Society (4)** Walton, Wolf
Lecture—3 hours; discussion—1 hour or term paper
or research project. Prerequisite: advanced standing
in the social sciences or one year of course work in
agricultural and environmental sciences. Develop-
ment of agriculture as a major enterprise in modern
society with the concomitant reduction in the labor
force and family farms. Analysis of issues including
mechanization, migrant labor, corporate farming, and
public resource policy. Offered in alternate years.
- 145A. Sociology of Third World Development (4) I.**
Wolf
Lecture—3 hours; discussion—1 hour. Prerequisite:
course 1; upper division standing. Introduction to
theories and contemporary issues in the sociology of
development. Topics such as urbanization,
rural/agrarian change, class, status groups, interna-
tional division of labor, sectoral shifts, international
capital, informal economy, gender, and political pro-
cesses are analyzed within a comparative-historical
framework.
- 145B. Gender and Rural Development in the Third
World (4) III.** Wolf
Seminar—4 hours. Prerequisite: course 1; upper divi-
sion standing. Political-economic analysis of women
and work during the process of socioeconomic
change in the world with particular attention to the
family/household context. Offered in alternate years.
- *146. Sociology of Religion (4)** Hall
Lecture—3 hours; discussion—1 hour or term paper
or research project. Relationship between social
structures and religions. The social setting of the
major world religions. Religious innovators and insti-
tutionalization (churches, sects, cults). Secularization
in the modern world and the rise of secular ideol-
ogies. Offered in alternate years.

147. Sociological Perspectives on East Asia (4) II. 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 alternate years.

***148. Collective Behavior (4) The Staff**

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Study of behavior of human crowds and masses in extraordinary circumstances, including crowd panics, mass scares, collective protests, riots, revolutionary situations, ecstatic and revivalist gatherings, crazes, fads, and fashions.

149. Religion and American Society (4) III. Hall

Lecture—3 hours; class project. Historical, contemporary survey of religious traditions and organizations and their relation to U.S. social and cultural patterns. Civil religion, religious pluralism, minority and deviant communities, religious migration, U.S. religion as a social institution, and religion, politics, and social stratification. Offered in alternate years.

150. Criminology (4) I. Cohen

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency (4) II. Cohen

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) II. 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. Melossi

Lecture—3 hours; discussion—1 hour or term paper or research project. Law considered as social control; relation of legal institutions to society as affecting judicial decision making and administration of justice. Lawyers as an occupational group. Legal reform.

156. Social Movements (4) II. J. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Analysis of several aspects of social movements: mobilization, forms of organization, ideology, recruitment, leadership, strategies and tactics, development, effects. Frequent use of sound and film materials.

157. Social Conflict (4) III. J. Lofland

Lecture—3 hours; discussion—1 hour or term paper or project. Analysis of the causes, dynamics, and regulation of social conflict within and between various kinds of social groupings with particular reference to nonviolent methods of waging and regulating conflict.

158. Consumer-Vendor Relationships (4) III. Roth

Lecture—3 hours; discussion—1 hour. Examine the relationship between consumers and the vendors of goods and services using case materials, student projects, and relevant literature in sociology and related fields. Emphasis will be on organizational structure and bargaining power.

159. Sociology of Occupations (4) II. Roth

Lecture—3 hours; discussion—1 hour or term paper or research project. Natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics.

165A. Sociological Theory (4) I. Melossi

Lecture—3 hours; discussion—1 hour or term paper or research project. Historical introduction to sociological theory with special reference to its European origins. The development of modern sociological

theory in Europe by Durkheim, Weber, Simmel, Pareto, Mosca, and others.

165B. Sociological Theory (4) II. Block

Lecture—3 hours; discussion—1 hour or term paper or research project. Contemporary sociological theory with special reference to the history of American sociology and the emergence of contemporary schools of thought in the United States. Schools discussed will include functionalism, symbolic interactionism, exchange theory, and ecology.

170. Population (4) I. Cramer

Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to the study of human population, including theories and statistical measures; social causes and consequences of population trends; changes in population structure; geographical distribution, migration, socio-psychological factors affecting fertility.

172. Ideology of Class, Race and Gender (4) Jackman

Lecture—4 hours. Examination of popular belief systems that accompany relations between social classes, whites and blacks, and men and women in the United States. How do dominant groups attempt to justify each relationship, and is there ideological conflict or consensus between groups.

***173. Sociology Through Literature (4) Walton**

Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to analysis of literature as sociological data. Reading of numerous works on American and other societies by authors such as Steinbeck, Lewis, Dreiser, Schulberg, Orwell, etc. Offered in alternate years.

180A. Complex Organizations (4) II. Hamilton

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. Hamilton

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.

***182. Experimental and Utopian Communities (4) III. Hackett**

Lecture—3 hours; discussion—1 hour. The social structure of intentional, experimental or Utopian settlements and communitarian movements, including comparison with other small settlement forms: villages, neighborhoods, monasteries, encampments and nonsettlement communities based on occupation, ethnicity, and religion.

***183. Comparative Organizations (4) III. Biggart**

Lecture—discussion—3 hours; term paper. Prerequisite: course 180A or 180B; upper division standing. Examination of economic and political organizations of major industrial nations. Discussion of historical, cultural, social, and political influences on industrial patterns and practices, alternative theoretical models for explaining differential development. Societies may include Sweden, Japan, Germany, Taiwan, and South Korea. Offered in alternate years.

185. Sociology of Social Welfare (4) III. Joffe

Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of the evolution and current organization of welfare functions in modern societies.

192. Internship and Research Practicum (2-12) I, II, III. The Staff

Internship—3-33 hours; discussion—1 hour. Prerequisite: upper division standing; course 46A; approval of proposed internship. Supervised internship and study in an agency, organization or institution; application of core concepts in sociology to the work

experience. May be repeated for credit only by permission. Maximum of 4 units of 192 may be counted toward the Sociology major. (P/NP grading only.)

194HA-194HB. Special Study for Honors Students (4-4) I-II. The Staff

Seminar—3 hours; term paper. Prerequisite: senior standing and admission to the Honors Program. Directed reading, research and writing culminating in the preparation of a Senior Honors Thesis under direction of faculty adviser. (Deferred grading only pending completion of course sequence.)

197T. Tutoring in Sociology (1-4) I, II, III. The Staff

Tutorial—3-12 hours. Prerequisite: upper division standing; completion of appropriate course with distinction. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, and leading discussion groups. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (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, Feinlee**

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. Block

Seminar—3 hours; paper. Prerequisite: consent of instructor. Open to graduate students in sociology and related disciplines. Course introduces students to topics and selected issues in the related fields of economic and political sociology and political economy.

220. Deviance, Law, and Social Control (4) I. Cohen

Seminar—3 hours; projects. Prerequisite: course 120 or consent of instructor. Report and discussions of literature on selected forms of deviance in relation to law and formal social control. Agency contacts and exploratory research projects.

***226. Sociological Social Psychology (4) 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) II. Jorgensen

Lecture—3 hours; paper. Advanced study of the determinants of ethnic groupings and their interrelationships. Major theme will be the patterns of ethnic stratification and causes of ethnic conflict. Specific focus upon dominance and resistance to dominance. Influence of social science research.

***234. Gender, Family, and Society (4) Stacey**

Seminar—3 hours; seminar paper. Prerequisite: graduate standing or consent of instructor. The major theoretical traditions and concerns in family sociology and sociology of gender. Analysis of selected classical and contemporary works representative of functionalist, Marxist, psychoanalytic, feminist and critical theoretical approaches to these subjects (e.g., Engels, Parsons, Freud, Horkheimer, Goode, Lasch, Mitchell). Emphasis on macro and historical questions.

242A-242B. Comparative Methods in Historical Sociology (4-4) II, III. Goldstone

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 sociologi-

cal 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 alternate years.

***243. Urban Society (4)** L. Lofland

Seminar—3 hours; paper. Broad overview of the issues and concerns of the field of urban sociology. Special emphasis on the human experience of urban living in contemporary, cross-cultural or historical settings.

245. Developing Societies (4) III. Walton

Seminar—3 hours; term paper or project. Prerequisite: graduate student status or familiarity with problems of developing societies. Analysis of social and economic problems of developing societies from the standpoint of theory and research on modernization and underdevelopment. Nature of third world dependency and interdependence in the global political economy. Offered in alternate years.

***248. Social Movements (4)** J. Lofland

Seminar—3 hours; paper. Analysis of current issues in and contributions to the study of collective behavior and social movements; particular focus upon the strategies and tactics of social movements.

254. Sociological Issues in Health Care (4) I. Roth
Seminar—3 hours; paper. Prerequisite: open to graduate or professional students. Sociological perspectives and methods directed to health care issues. Students select topics for supervised research. The course will have a theme (described in advance) each time it is offered. Paper on research will be required. (S/U grading only.)

***255. Sociology of Law (4)** III. Melossi

Seminar—4 hours. Prerequisite: consent of instructor. Analysis of the nature of the legal process and its impact on social behavior. Will consider (1) nature and functions of law, (2) the organization and administration of law, and (3) the capacity of law to affect social behavior.

264. Proseminar in Sociology (4) I. The Staff

Seminar—4 hours. Prerequisite: limited to first year Sociology graduate students. Introduction to sociological concepts at an advanced level. Subjects include culture, social interaction, stratification, deviance, demography, collective behavior, organizations and other topics in which the department offers further specialized work. Various approaches to sociological analysis are examined.

***270. Social Demography (4)** Cramer

Seminar—4 hours. Prerequisite: course 170 or consent of instructor. How social institutions affect and are affected by the level and variation of mortality, migration, and fertility. Special emphases on the determinants of fertility-related attitudes and behavior, on less-developed countries, and on contemporary empirical studies.

280. Organizations and Institutions (4) III. Hackett
Seminar—4 hours. Theory of formal organizations and bureaucracy. Methods of research in organizational and institutional studies. Historical and comparative analysis of political, religious, educational, military, and economic structure.

290. Seminar (4) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours; term paper. (S/U grading only.)

***292A-292B. Field Research (4-4)** II-III. Wolf

Seminar—3 hours; field trips. Prerequisite: graduate standing in Sociology or consent of instructor. The process of collecting, analyzing and reporting qualitative social data: techniques of intensive interviewing, participant-observation and document analysis; generating, developing, and evaluating analytic frameworks; recording, storing, retrieving, and writing up qualitative data. Emphasis on application of principles; each participant completes a field work project. (Deferred grading only, pending completion of sequence.) Offered in alternate years.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Soil and Water Science

(College of Agricultural and Environmental Sciences)

The Major Program

Soil and water science is concerned with the use and protection of our land and water resources. The major teaches graduates sound scientific principles for managing soil and water resources to benefit both agriculture and the environment.

The Program. Major programs are designed to include land use, soil survey, soil management and conservation, plant nutrition, diagnostic technology, irrigation and drainage, water resources management, water quality, and related environmental problems. (For example, the emphasis on water quality would include more than the minimum number of units of physical and biological sciences, while an emphasis in resource allocation and land-use planning would include more courses in the social, political, and economic areas.)

Internships and Career Alternatives. Before they graduate, many students receive practical work experience through student internships with state and federal agencies, soil and plant labs, and growers. Students also have the opportunity to work on research projects with faculty members and to develop individual research or study topics. Graduates are qualified for managerial and technical positions with environmental and agricultural businesses. They are also prepared for positions in advising, planning, land appraisal, and research and teaching with private, government, and international organizations involved with soil and water development, use, and conservation. Some graduates also continue in master's and doctoral programs in soil science, water science, ecology, and plant physiology.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
English Composition Requirement	4-12
See College requirement	0-8
Oral expression (Rhetoric 1)	4
Preparatory Subject Matter	74
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
Chemistry (Chemistry 1A-1B-1C and a more advanced course).....	18
Computer science (Agricultural Science and Management 21, Engineering 5)	3
Economics or agricultural economics (Economics 1A, 1B).....	5
Geology (Geology 50).....	3
Mathematics (Mathematics 16A, 16B).....	6
Physics (Physics 5A-5B-5C)	12
Statistics (Statistics 13, Agricultural Science and Management 150).....	4
Additional physical sciences, biological sciences, and/or mathematics with approval of adviser	8
Breadth/General Education	15-33
Satisfaction of General Education requirement	6-24
At least one upper division course from each of the following areas, with approval of adviser, (1) resource management, (2) environmental law, (3) environmental economics and decision making.....	9

*Course not offered this academic year.

Depth Subject Matter	30
Soil Science 100.....	4
Water Science 100.....	4
Additional upper division units in soil science and water science.....	22
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	9-28
Total Units for the Degree	180

Specific Courses of Instruction. For specific courses of instruction in this major, see course listings under Atmospheric Science, Plant Science, 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 (916-752-1669).

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. M.J. Singer, (*Land, Air, and Water Resources*).

Courses in Soil Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (916-752-1669).

Lower Division Courses

10. Concepts of Soil Science (3) I. Dahlgren, 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)
Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Soil Science (4) I. Munns
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B, Physics 1A-1B, Biological Sciences 1A, and consent of instructor; Geology 50, Biological Sciences 1C, Microbiology 2, and Chemistry 8A recommended. Formation, properties and behavior of soils. Nature and interactions of solid, aqueous, gaseous, and biotic components. Soil-plant-atmosphere relationships. Soil development and geography, management, and conservation.

102. Soil and Water Chemistry (5) II. 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. Dahlgren, Singer, Southard
On campus—daily 1 week; study tour—daily 5 weeks. Prerequisite: consent of instructor; course 120 recommended. *In situ* soil studies with emphasis on the interactions between soil characteristics and kinds of land use. Field identification and evaluation of soils for agricultural, range, forest, urban, and other uses.

107. Soil Physics (4) I. Rolston
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100, Water Science 100, Mathematics 16A, or the equivalent. Description of soil physical properties. Principles of water, gas, heat, and solute movement in soil with selected examples related to soil and water management. Influence of soil physical properties on transfer processes.

109. Soil Fertility and Fertilizers (4) III. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in elements of soil science. Forms and availability of plant nutrient elements in soils; effects of fertilizers and soil amendments on crop and soil characteristics; conduct and interpretation of soil fertility assays.

111. Geomicrobiology (4) II. Scow
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 one-day field trips. Prerequisite: course 100 or consent of instructor. Soils are considered as elements in land use planning and environmental quality. Topics include: soil survey reports, remote sensing, land capability classification, soil erosion/conservation, waste disposal on soils and soil reclamation.

120. Soil Genesis, Morphology, and Classification (5) III. Southard
Lecture—4 hours; laboratory—3 hours (includes five one-day weekend field trips). Prerequisite: course 100 and Geology 1; 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. The Staff
Lecture—1 1/2 hours; discussion—1 1/2 hours. Prerequisite: course 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 alternate years.

192. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

207. Transport Processes in Soils (4) II. Rolston Hopmans

Lecture—3 hours; discussion/laboratory—2 hours. Prerequisite: Mathematics 22B and course 107; knowledge of a computer programming language. Physical and mathematical description of nonsteady transport processes in soil and the unsaturated zone. Emphasis on analytical and numerical solutions to water, gas, solute (contaminants), and heat transport processes and the chemical and biological reactions attenuating solute movement.

208. Soil-Plant Interrelationships (3) II. The Staff
Lecture—3 hours. Prerequisite: course 100; Botany 112; 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. Advanced Soil Microbiology (2) III. Scow
Lecture—2 hours. Prerequisite: Chemistry 8A-8B; course 111; Biochemistry & Biophysics 101A, 101B, or an equivalent course recommended. Microbial metabolism of organic chemicals in soil, both natural and xenobiotic. Decomposition of organic matter. Kinetics of microbial processes in soil.

214. Soil Mineralogy (5) III. Dahlgren
Lecture—3 hours; laboratory—6 hours. Prerequisite: course in soil chemistry or consent of instructor. Nature, properties, and occurrence of the common minerals in soils and rocks. Weathering reactions and stability of minerals in the weathering environment. Application of analytical methods in mineral analysis, including x-ray, microscopic and chemical analysis for characterization of mineral systems. Offered in alternate years.

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 alternate 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 alternate years.

220. Pedology (3) II. 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 alternate years.

290. Special Topics in Soil Science (1) I, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing. Oral presentation and discussion of scientific material and procedures for review and critique of publications. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Soil Science (A Graduate Group)

James W. Biggar, Ph.D., Chairperson of the Group
Group Office, 122 Hoagland Hall (916-752-1669)

Faculty. Includes faculty members from the Departments of Agricultural Engineering; Agronomy and Range Science; Civil Engineering; Land, Air, and Water Resources; Nematology; Pomology; or Viticulture and Enology.

Graduate Study. The Graduate Group in Soil Science offers programs of study and research leading to the M.S. and Ph.D. degrees. Soil science focuses on the processes which govern the quality and distribution of the soils relative to landform evolution, geochemical environments, and organism habitats. Opportunities in soil science include the study of soil as a global natural resource, as a critical component of environmental sciences, and as a resource to sustain agricultural and wildland ecosystems. Students may specialize in: general soil science; soil physics; soil chemistry; soil genesis, morphology and classification; soil fertility and plant nutrition; soil microbiology and biochemistry; environmental quality; or soil-plant-water relationships. For detailed information regarding the programs, address the chairperson of the group.

Graduate Advisers. Consult the Group Office.

Spanish

(College of Letters and Science)

_____, Ph.D., Chairperson of the
Department

Department Office (Spanish and Classics), 616
Sproul Hall (916-752-0835)

Faculty

Marta E. Altisent, Ph.D., Associate Professor
Samuel G. Armistead, Ph.D., Professor
Donald G. Castanien, Ph.D., Professor Emeritus
Angie C. Chabram, Ph.D., Assistant Professor
Gonzalo Díaz-Migoyo, Ph.D., Professor
Zunilda Gertel, Ph.D., Professor
Mario González, Ph.D., Lecturer Emeritus
Germán Gullón, Ph.D., Professor
Didier T. Jaén, Ph.D., Professor Emeritus
Daniel S. Keller, Ph.D., Professor Emeritus
Almerindo E. Ojeda, Ph.D., Assistant Professor (*Linguistics*)
Fabián A. Samaniego, M.A., Senior Lecturer
Antonio Sánchez-Romero, Ph.D., Professor
Robert M. Scari, Ph.D., Professor
Máximo Torreblanca, Ph.D., Professor (*Linguistics*)
Hugo J. Verani, Ph.D., Professor

The Major Program

The major in Spanish is designed to develop competence in the spoken and written language. Depending on their professional goals, students may emphasize either language or literature.

The Program. The department's lower division program gives students a solid foundation in the Spanish language. Then, at the advanced level, students are able to emphasize the study of either language or literature, or a combination of both. Courses at the advanced level give students the opportunity for close study of the great works of Hispanic literature

and for a more detailed understanding of the language's sound system and grammatical structure. Other courses afford a broad overview of the main currents in Spanish and Spanish-American literature and culture. Many students combine the Spanish major with another academic major such as Chicano studies, linguistics, international relations, comparative literature, economics, a social science, or another foreign language. The department encourages its majors to consider summer study in a Spanish-speaking country or to spend their junior year in Spain or Mexico with the University of California's Education Abroad Program.

Career Alternatives. 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 Chicano studies, international relations, linguistics, comparative literature, art, history, and philosophy.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-33
Spanish 1, 2, 3, 21 or 7A, 22 or 7B, and 23	0-31
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, G. Gullón, 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

† Minor Program and courses in Portuguese not offered in 1991-92.

	UNITS
Spanish	24-27
Spanish 100	3
One course in Hispanic literature (any course)	4

One course in culture from Spanish 134, 135, 136

One course in advanced composition from Spanish 110A, 110B

One course from Spanish 131, 132, or 133

Two elective courses acceptable for the Spanish major chosen in consultation with a major adviser

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. The Staff. 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. H. Verani.

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 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 alternate 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 alternate 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 alternate 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 the Contemporary period. Offered in alternate 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 alternate 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 alternate 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 alternate 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 alternate 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 alternate 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 Caello, Alvaro de Campos, and Ricardo Reis. Offered in alternate 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 alternate 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 Bessay Lufs. Offered in alternate 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)
Discussion—5 hours; laboratory—1 hour. Introduc-

*Course not offered this academic year.

tion to Spanish grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Spanish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

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.

7C. Reading and Composition for Native Speakers (4) III. The Staff

Discussion—3 hours; term paper. Prerequisite: course 5 or 7B before enrolling in this course. Reading and discussion of selected Chicano and Latin American prose masterpieces, to acquaint bilingual students, or students whose native language is Spanish, with a variety of writing styles in prose. Written essays will be assigned regularly. Open to majors and non-majors.

8. Elementary Spanish Conversation (2) I, II, III. The Staff (Scott in charge)

Discussion—3 hours. Prerequisite: course 3; course 21 (concurrently) recommended. Designed to develop oral communication skills. Emphasis on increasing vocabulary, improving listening comprehension, pronunciation, accuracy and grammar control. Practice of everyday situations. Not open to native speakers or to upper division students.

9. Intermediate Spanish Conversation (2) I, II, III. The Staff

Discussion—3 hours. Prerequisite: course 8 or 22; course 23 (concurrently) recommended. Continuation of course 8. Designed to develop oral communication skills at a more advanced level. Practice of more complex situations. Not open to native speakers or to upper division students.

21. Intermediate Spanish (5) I, II, III. The Staff (Scott in charge)

Lecture/discussion—5 hours; laboratory—1 hour. Prerequisite: course 3. Designed to review and develop the grammar, vocabulary and composition acquired in the first year through exercises and reading of modern texts. It is recommended that students transferring from other institutions start the second-year program at this point.

22. Intermediate Spanish (5) I, II, III. The Staff (Scott in charge)

Lecture/discussion—5 hours; laboratory—1 hour. Prerequisite: course 21. Continuation of Spanish 21. Focus on more difficult grammatical concepts and further practice on composition. Development of all language skills through exercises and reading of modern texts.

23. Spanish Composition (4) I, II, III. The Staff (Scott in charge)

Lecture/discussion—3 hours. Development of writing skills by way of writing original compositions, preparing summaries from original texts, and further grammar review. Limited to 20 students.

24. Introduction to Literature (3) I, II, III. The Staff (Scott in charge)

Lecture/discussion—3 hours. Prerequisite: course 22; course 23 (concurrently) recommended. Read-

ing and discussion of selected masterpieces—drama and prose—to acquaint the student with a variety of writing styles and literary genres. Written essays will be assigned.

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, Diaz-Migoyo, Sánchez-Romero

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, Diaz-Migoyo, Sánchez-Romero

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, Gullón, Sánchez-Romero, 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 alternate years.

104B. Hispanic Literature II: Modern Peninsular (4) I. Altisent, Gullón, Sánchez-Romero, 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 alternate 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 alternate 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 alternate years.

109. Spanish Drama of the Golden Age (4) III. Sánchez-Romero

Lecture—3 hours; conferences and reports. Prerequisite: course 100. Offered in alternate 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 Quixote (4) II. Diaz-Migoyo

Lecture—3 hours; written reports. Prerequisite: course 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 alternate years.

114. Spanish Romantic Literature (4) II. Gullón, 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 alternate years.

115. Lyric Poetry of the Golden Age (4) III. Sánchez-Romero

Lecture—3 hours; term paper. Prerequisite: course 100. Offered in alternate years.

119. Spanish Novel of the Nineteenth Century (4) III. Gullón, Scari

Lecture—3 hours. Prerequisite: course 100. Offered in alternate years.

120A. Twentieth-Century Spanish Fiction (4) I. Altisent, Diaz-Migoyo, Gullón

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 alternate years.

120C. Twentieth-Century Spanish Poetry (4) III. Sánchez-Romero

Lecture—3 hours; term paper. Prerequisite: course 100. Offered in alternate years.

124. Chicano Culture (4) I. Chabram

Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Study of Chicano culture in the Southwest from 1598 to the present, emphasis on the period after 1848. Lectures and discussions in English; readings in English and/or Spanish. May not be counted as part of major in Spanish. Offered in alternate 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 Modernismo (1880 to 1916). Offered in alternate 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 alternate 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 alternate 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 alternate 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 alternate 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 alternate years.

129. The Mexican Novel (4) III. Chabram, Gertel, Jaén, Verani
Lecture—3 hours; term paper. Prerequisite: course 100 or consent of instructor. Major figures in the development of the Mexican novel. Offered in alternate years.

131. Modern Spanish Syntax (4) I. Ojeda
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or consent of instructor. Study of word relationships in European and American Spanish, with special attention to syntax of verbs.

132. Introduction to Spanish Linguistics (3) III. Ojeda, Torreblanca
Lecture—3 hours. Prerequisite: course 28 or consent of instructor. Principles of classical phonemics and morphemics together with more recent developments; descriptive analysis of modern Spanish sounds and forms. Theoretical and practical comparison with English and other Romance Languages.

133. Spanish Phonetics (3) I, II. Torreblanca
Lecture—3 hours. Prerequisite: course 28 or consent of instructor. The sound structure of modern Spanish; theoretical analysis of selected problems in pronunciation. Strongly recommended for prospective teachers.

134. Survey of Spanish Culture (4) I. Altisent, Díaz-Migoyo
Lecture—3 hours; paper. Prerequisite: course 28. Offered in alternate years.

135. Survey of Mexican Culture (4) II. Chabram
Lecture—3 hours; paper. Prerequisite: course 28 or consent of instructor. Offered in alternate 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.

140. Hispanic Fiction in Film (4) II. Altisent, Gullón, Jaén
Laboratory-discussion—3 hours; term paper. Prerequisite: course 100. Hispanic fiction and its filmic adaptations. May concentrate on a single author,

such as Borges, Galdós, García Márquez, or may be general or regional in coverage. May be repeated once for credit with consent of instructor. Offered in alternate years.

149. Latin-American Literature in Translation (4) III. Gertel, Jaén, Verani
Lecture—3 hours; term paper. Prerequisite: course 100. Reading, lectures, and discussion in English of works by Neruda, Vallejo, Borges, García Márquez, Paz, and others. May not be counted toward major in Spanish. Offered in alternate years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE preparation: Comparative Literature 1, 2, or 3.

150. Masterpieces of Spanish Literature (4) I. Armistead, Gullón, Scari
Lecture—3 hours; paper. Readings, 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 (1-12) I, II, III. The Staff (Chairperson in charge)
Independent study—3-36 hours. 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; term paper. 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, Gullón, Verani
Seminar—3 hours; term paper. 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; term paper. Offered in alternate years.

220A. History of the Spanish Language (4) I. Torreblanca
Seminar—3 hours; term paper. Prerequisite: Latin 1.

220B. History of the Spanish Language (4) II. Torreblanca
Seminar—3 hours; term paper. Prerequisite: Latin 1.

221. Hispanic Dialectology (4) III. Torreblanca
Seminar—3 hours; term paper. 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; term paper. 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 alternate years.

225B. Masterworks of Medieval Spanish Literature (4) II. Armistead
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of late Medieval prose works: didactic prose; sentimental and chivalric novel; *La Celestina*. Offered in alternate years.

225C. Medieval Spanish Epic (4) III. Armistead
Seminar—3 hours; term paper. 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 alternate years.

225D. Medieval Lyric (4) I. Armistead
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of representative early lyric poetry in the various peninsular languages. Offered in alternate years.

226. El libro de buen amor (4) II. Armistead
Seminar—3 hours; term paper. 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 alternate years.

227. El Romancero (4) III. Armistead
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of Hispanic ballad literature from the fifteenth century to the present. Offered in alternate years.

228. Folk Literature of the Hispanic World (4) I. Armistead
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of the various genres of oral traditional literature among the Hispanic peoples. Offered in alternate years.

229. Spanish Literature of the Early Renaissance (4) I. Armistead
Seminar—3 hours; term paper. Spanish literature, 1450-1550, with emphasis on *La Celestina*.

231A. Spanish Literature of the Golden Age: Lyric Poetry (4) I. Sánchez-Romeralo
Seminar—3 hours; term paper. Sixteenth-century currents in Spanish poetry. Offered in alternate years.

231B. Spanish Literature of the Golden Age: Lyric Poetry (4) II. Sánchez-Romeralo
Seminar—3 hours; term paper. Seventeenth-century currents in Spanish poetry. Offered in alternate years.

231C. Spanish Literature of the Golden Age: Literature of Ideas (4) II. Díaz-Migoyo
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Offered in alternate years.

231D. Spanish Literature of the Golden Age: Narrative (4) II. Díaz-Migoyo
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Offered in alternate years.

231E. Spanish Literature of the Golden Age: The Drama (4) II. Sánchez-Romeralo
Seminar—3 hours; term paper. Offered in alternate years.

232. Cervantes (4) I. Díaz-Migoyo
Seminar—3 hours; term paper. Major works of Cervantes and of the principal Cervantine critics. Offered in alternate years.

234A. Twentieth-Century Spanish Poetry (4) I. Sánchez-Romeralo
Seminar—3 hours; term paper. From 1898 up to the Generation of 1927.

234B. Twentieth-Century Spanish Poetry (4) II. Sánchez-Romeralo
Seminar—3 hours; term paper. New trends in Spanish poetry from 1927 to the present.

235A. Twentieth-Century Spanish Novel (1900-1936) (4) I. Altisent, Gullón
Seminar—3 hours; term paper. 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 alternate years.

235B. Twentieth-Century Spanish Novel (4) II. Altisent, Gullón
Seminar—3 hours; term paper. 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 alternate years.

236. Twentieth-Century Spanish Thinkers (4) III. Gullón, Scari
Seminar—3 hours; term paper. Major thinkers from Gariñet to Unamuno and Ortega y Gasset. Emphasis will be placed on the relationships between Spanish thought and European philosophical currents. Offered in alternate years.

237. Twentieth-Century Spanish Drama (4) I. Altisent
Seminar—3 hours; term paper. 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 alternate years.

238. Spanish Romanticism (4) I. Gullón, Scari
Seminar—3 hours; term paper. Sources and development of Romanticism in Spain, particularly in poetry and drama.

239. Galdós and Spanish Realism (4) II. Gullón, Scari
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Offered in alternate 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 alternate years.

241A. Spanish-American Novel, 1900-1950 (4) I. Gertel, Verani
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Study of main trends and key authors in Spanish-America in the first half of the twentieth century. Offered in alternate years.

241B. New Trends In Spanish-American Fiction (4) II. Gertel, Verani
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Recent development in Spanish-American narrative. Emphasis on innovative language and structure. Offered in alternate years.

242. The Mexican Novel (4) III. Gertel, Jaén
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Emphasis on twentieth-century Mexican novel from Azuela, Yáñez, Rulfo, Fuentes to the present. Offered in alternate years.

243. Spanish-American Short Story (4) III. Gertel, Jaén, Verani
Seminar—3 hours; term paper. 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; term paper. Prerequisite: graduate standing or consent of instructor. Study of poetry and prose of Spanish-American Modernismo (1880 to 1916). Offered in alternate years.

247. New Directions in Spanish-American Poetry (4) III. Gertel, Verani
Seminar—3 hours; term paper. Offered in alternate years.

248. The Spanish-American Essay (4) II. Gertel, Jaén
Seminar—3 hours; term paper. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in alternate years.

251. Studies on a Major Writer, Period, or Genre (4) III. The Staff
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Artistic development of a major writer and his/her intellectual and literary milieu or study of a special topic, period or genre. May be repeated for credit with consent of instructor.

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. (S/U grading only.)

Speech

See Rhetoric and Communication

Statistics

(Intercollege Division)

George G. Roussas, Ph.D., Chairperson of the Division and Associate Dean of Statistics
Division Office, 469 Kerr Hall (916-752-2361)

Faculty

- P.K. Bhattacharya, Ph.D., Professor
- Prabir Burman, Ph.D., Associate Professor
- Christiana Drake, Ph.D., Assistant Professor
- Alan P. Fenech, Ph.D., Associate Professor
- Wesley O. Johnson, Ph.D., Associate Professor
- Yue-Pok (Ed) Mack, Ph.D., Professor
- Hans-Georg Mueller, Ph.D., Professor
- George G. Roussas, Ph.D., Professor
- Francisco J. Samaniego, Ph.D., Professor
- Robert H. Shumway, Ph.D., Professor
- Jessica M. Utts, Ph.D., Associate Professor
- Jane-Ling Wang, Ph.D., Associate Professor
- Alvin D. Wiggins, Ph.D., Professor
- Yannis G. Yatracos, Associate Adjunct Professor

The Major Program

Statistics enables us to make inferences about entire populations, based on samples extracted from those populations. Statistical methods can be applied to problems from almost every discipline and they are vitally important to researchers in agricultural, social, engineering, and medical sciences.

The Program. Statistics majors may receive either a Bachelor of Arts or a Bachelor of Science degree. The A.B. degree is very flexible, facilitating a double major or extensive elective course work in a field in which statistics is applied. The B.S. degree program has two options: one emphasizes mathematics and is especially recommended as preparation for graduate study in statistics; the other emphasizes computer science. All three programs require theoretical and applied course work and underscore the strong interdependence of statistical theory and the applications of statistics.

Preparatory Requirements. Before applying for either the A.B. or B.S. major in Statistics, students must ordinarily complete the following courses with at least C grades:

- Mathematics 21A, 21B, 21C
- Mathematics 22A, 22B
- Computer Science Engineering 30 or

Engineering 5
Statistics 32

In addition, due to space limitation in the B.S. major, students admitted to this major will normally be chosen from those having at least a 3.0 grade-point average in the above courses. For further information, please contact a Statistics adviser.

Career Alternatives. Probability models and statistical methods are used in a great many fields, including the biological and social sciences, business and engineering. The wide applicability of statistics has created in both the public and private sectors a strong demand for graduates with statistical training. Current employment opportunities include state and federal government positions with a statistician designation, industrial positions (e.g., in the actuarial series within an insurance company or in the data management unit in a health science facility), and teaching positions.

A.B. Major Requirements:

	UNITS
Preparatory Subject 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

B.S. Major Requirements:

	UNITS
(Options: Statistics—general; Statistics—Computer Science)	
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

*Course not offered this academic year.

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 Major75-85
 (General option)

Computer Science option

Depth Subject Matter49-53
 Analysis of variance, multiple regression, Statistics 106, 108 (or the equivalent)8
 Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C.....12
 Two courses having Statistics 131B as a prerequisite6-7
 Statistical computing, Statistics 1413
 Operating systems and System programming, Computer Science Engineering 1504
 Data structures, Computer Science Engineering 1104
 Data base systems, Computer Science Engineering 165 or Mathematics 1603-4
 Mathematics, two courses from Mathematics 128A, 128B, 132A, 132B, 167, 1686-8
 Computer Science Engineering 122, or Computer Science Engineering 175.....3

Total Units for the Major73-84
 (Computer Science option)

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

Statistics19-20
 Statistics 106, 108, and 130A-130B or 131A-131B16
 One course in Statistics having Statistics 130B or 131B as a prerequisite3-4
 Preparation: Statistics 13 or 32.

Graduate Study. The Graduate Group in Statistics offers study and research leading to the M.S. and Ph.D. degrees in Statistics. Detailed information concerning these degree programs, as well as information on admissions and on financial support, is available from the Division of Statistics.

Graduate Adviser. F.J. Samaniego.

Statistical Consulting. The Division provides a consulting service for researchers on campus. For more information, call the Statistical Laboratory Office (916-752-6096).

Courses in Statistics

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 alternate years.

13. Elementary Statistics (4) I, II, III. The Staff
 Lecture—4 hours. Prerequisite: two years of high school algebra. Measures of central tendency and dispersion; binomial, normal, Student-t, and chi-square distributions; testing hypotheses; nonparametric statistics; regression and correlation theory. (Students who have had courses 130A or 131A may not receive credit for Statistics 13.)

32. Basic Statistical Analysis Through Computers (3) II, III. The Staff
 Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; ability to program in a high-level computer language such as Pascal. Overview of probability modeling and statistical inference. Problem solution through mathematical analysis and computer simulation. Recommended as alternative to course 13 for students with some knowledge of calculus and computer programming.

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 nonparametric estimation and testing; analysis of variance; regression; computing with Minitab package. Students who have had course 13 may receive only 2 units of credit for course 102.

103. Applied Statistics for Business and Economics (4) I, II, III. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 13, 32, or 102. Descriptive statistics; probability; random variables; expectation; binomial, normal, Poisson, other univariate distributions; joint distributions; sampling distributions, central limit theorem; properties of estimators; linear combinations of random variables; testing and estimation; Minitab computing package.

104. Applied Statistical Methods: Nonparametric Statistics (3) II. The Staff
 Lecture—3 hours. Prerequisite: course 13, 32, or 102. Sign and Wilcoxon tests, Walsh averages. Two-sample procedures. Inferences concerning scale. Kruskal-Wallis test. Measures of association. Chi square and Kolmogorov-Smirnov tests. Offered in alternate years.

106. Applied Statistical Methods: Analysis of Variance (4) I, II. The Staff
 Lecture—4 hours. Prerequisite: course 13, 32, or 102. One-way and two-way fixed effects analysis of variance models. Randomized complete and incomplete block design, Latin squares. Multiple comparisons procedures. One-way random effects model.

108. Applied Statistical Methods: Regression Analysis (4) II, III. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 13, 32 or 102. Simple linear regression, variable selection techniques, stepwise regression, analysis of covariance, influence measures, computing packages.

110. Applied Statistical Methods: Multivariate Analysis (3) 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 comparison methods. Estimation of simple, multiple, and partial correlation coefficients. One-way MANOVA. Linear discriminant functions. Principal component analysis. Factor analysis. Offered in alternate years.

120. Probability and Random Variables for Engineers (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21A, 21B, 21C, and 22A. Basic con-

cepts of probability theory with applications to electrical engineering, discrete and continuous random variables, conditional probability, combinatorics, bivariate distributions, transformation of random variables, law of large numbers, central limit theorem, and approximations.

130A. Mathematical Statistics: Brief Course (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B. Concepts of a probability space, conditional probability and independence, discrete and continuous random variables, moments and moment generating functions, transformation of random variables, commonly used probability models, joint distribution of random variables, correlation, marginal and conditional distributions.

130B. Mathematical Statistics: Brief Course (4) II. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B and course 130A. Sampling distributions, sums of random variables, the t, F, and X² distributions, central limit theorem and applications, fundamentals of point and interval estimation, one-sample and two-sample hypotheses testing. Introduction to regression analysis, and analysis of variance.

131A. Introduction to Probability Theory (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21A, 21B, 21C, and 22A. Fundamental concepts of probability theory, discrete and continuous random variables, standard distributions, moments and moment-generating functions, laws of large numbers and the central limit theorem. Students who have had Mathematics 131 may not receive credit for Statistics 131A.

131B-131C. Introduction to Mathematical Statistics (4-4) II-III. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 131A, or Mathematics 22A and 131. Sampling, methods of estimation, sampling distributions, confidence intervals, testing hypotheses, linear regression, analysis of variance, elements of large sample theory, and nonparametric inference.

132. Engineering Statistics (4) III. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; one 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.

133. Applied Stochastic Modeling and Statistical Theory (6) I. Samaniego
 Lecture—5 hours; discussion—1 hour. Prerequisite: course 103 and Mathematics 16B, or their equivalent. Probability laws, random variables, mathematical expectation, univariate and multivariate probability models; convergence concepts, the theory of estimation, topics in hypothesis testing.

***134. Nonparametric Inference (3) II.** The Staff
 Lecture—3 hours. Prerequisite: course 130B or 131B. Selected topics in nonparametric statistical inference from a one-sample and a k-sample point of view. Topics include Kolmogorov-Smirnov type tests; confidence intervals for quantiles, location and scale parameters; rank tests, dispersion tests, efficiency. Offered in alternate years.

***135. Multivariate Data Analysis (3) I.** 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. Offered in alternate years.

136. Applied Linear Models (4) III. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A; and either course 130B or 132; or course 131B. Introduction to regression analysis and analysis of variance within the framework of linear models: general linear model; simple and multiple

*Course not offered this academic year.

linear regression, polynomial regression; one-factor and multi-factor analysis of variance; nested models, multiple comparisons; analysis of covariance.

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: course 130B or 131B, or courses 106 and 108. Varieties of categorical data, cross-classifications, contingency tables, tests for independence. Multidimensional tables and log-linear models, maximum likelihood estimation; tests of goodness-of-fit. Logit models, linear logistic models. Analysis of incomplete tables. Packaged computer programs, analysis of real data.

140. Introduction to Biostatistics (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 106 and 108, or any one of courses 130B, 131B, 132, or 133. Clinical trials, diagnostic tests, epidemiology, observational studies, epidemiology of infectious diseases, longitudinal studies, survival analysis, toxicology and dose-response analysis.

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 alternate 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 alternate 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 alternate 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 I (4) I. Mueller
Lecture—3 hours; discussion—1 hour. Prerequisite: one of the following courses: 231A, 131B, 130B, 132, or 133; and either course 136 and 139, or course 106 and 108. Clinical trials, cross-over design, randomization models, sequential monitoring methods, applications to clinical trials, observational studies, case-control and cohort studies, estimation of risks, diagnostic procedures, dose-response relations, combination of drugs, low-dose extrapolation.

222. Biostatistics II (4) II. Mueller
Lecture—3 hours; discussion—1 hour. Prerequisite: course 231A, 231B, and 231C; or course 230 and consent of instructor. Parametric survival models, nonparametric survival models, semiparametric survival models, applications of survival methods in epidemiology, data analysis, computer packages.

223. Biostatistics III (4) III. Mueller
Lecture—3 hours; discussion—1 hour. Prerequisite: course 231A, 231B, and 231C; or course 230 and consent of instructor. Generalized linear models, longitudinal studies, stochastic models in epidemiology and medicine, advanced biostatistical topics, advanced biostatistical data analysis.

230. Brief Advanced Mathematical Statistics (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 131A, 131B, 131C, and Mathematics 167, or their equivalent. Distribution theory, modes of convergence, laws of large numbers, central limit theorem, Slutsky's Theorem, δ -method, consistency and asymptotic normality of maximum likelihood estimates, method of scoring, hypotheses testing based on likelihood ratios, Pitman efficiency, concepts of decision theory, Bayesian inference. Students who have received credit for courses 231A, 231B, or 231C may receive only 2 units, 1 unit, or no credit respectively for course 230.

231A-231B-231C. Mathematical Statistics (4-4-4) I-II-III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131C and Mathematics 127A-127B or the equivalent. Distribution theory, decision theoretic methods, estimation and hypotheses testing, multivariate techniques, large sample theory.

232A-232B. Linear Model Theory (4-4) II-III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons.

***233. Design of Experiments** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 131C. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces. Offered in alternate years.

235A-235B-235C. Probability Theory (3-3-3) I, II, III. Lecture—3 hours. Prerequisite: Mathematics 127C and courses 131A-131B or the equivalent. Measure theoretic foundations, abstract integration, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time, Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. (Same course as Mathematics 235A-235B-235C.)

237A. Time Series Analysis: Foundations (3) I. The Staff
Lecture—3 hours. Prerequisite: course 131A or Mathematics 131 or the equivalent. Basic structure of stationary and non-stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the discrete Fourier transform, laws of large numbers, autoregressive moving average processes. Offered in alternate years.

237B. Time Series Analysis: Statistical Inference (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 131B-131C

and 237A. Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance, ARIMA processes, state space models, and maximum likelihood estimation. Offered in alternate years.

***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 correlations; 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 alternate 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 alternate years.

***250. Advanced Data Analysis** (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 141, 232A and either course 230 or 231A. Resampling methods and one to three additional topics selected from nonparametric and semi-parametric methods, incomplete data analysis, diagnostics, nonstandard multivariate and time series analysis, applied Bayesian methods, sequential analysis and quality control, categorical data analysis. Offered in alternate 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. 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 (916-752-2361)

Faculty. The Group has approximately thirty faculty members from all colleges, schools, and divisions, including twelve from the Intercollege Division of Statistics.

Graduate Study. The Graduate Group in Statistics offers programs of study and research leading to the M.S. and Ph.D. degrees. The M.S. is designed to

give students a strong foundation in the theory of statistics as well as substantial familiarity with the most widely used statistical methods. Facility in computer programming is essential for some of the course work. The supervised statistical consulting required of all M.S. students has proven to be a valuable educational experience. The Ph.D. program combines advanced course work in statistics and probability with the opportunity for in-depth concurrent study in an applied field. For detailed information, see the *Graduate Announcement*, or contact the Chairperson of the Group.

Preparation. For admission to the Ph.D. program, course work requirements for the master's degree, and at least one semester/two quarters of advanced calculus must be completed.

Graduate Adviser. F.J. Samaniego.

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
(916-752-3599)

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 Emeritus
Ira M. Gourley, D.V.M., Ph.D., Professor Emeritus
Clare R. Gregory, D.V.M., Associate Professor
Steve C. Haskins, D.V.M., M.S., Professor
Susan V. Hildebrand, D.V.M., Associate Professor
Terrell A. Holliday, D.V.M., Ph.D., Professor Emeritus
Janet E. Ilkiw, B.V.Sc., Ph.D., Assistant Professor
David N. Krag, M.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., Associate Professor
Peter J. Pascoe, B.V.Sc., Assistant Professor
Jack R. Snyder, D.V.M., Ph.D., Assistant Professor in Residence

Eugene P. Steffey, V.M.D., Ph.D., Professor
Gordon H. Theillen, D.V.M., Professor
Philip B. Vasseur, D.V.M., Associate Professor
John D. Wheat, D.V.M., Professor Emeritus
Alida P. Wind, M.V.D., Senior Lecturer

Part-Time Clinical Faculty

Gregory L. Ferraro, D.V.M., Associate Clinical Professor

Dennis V. Hacker, D.V.M., Assistant 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
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. Steffey
Discussion—1 hour. Laboratory—4 hours. Prerequisite: course 230 concurrently. Laboratory to complement course 230. Limited enrollment. (S/U grading only.)

291. Anesthesia/Critical Care Basic Science Conference (1) I, II, III. The Staff (P. Pascoe in charge)
Discussion—1 hour. Prerequisite: postdoctoral, medical, or graduate student; consent of instructor. Advanced course in scientific foundations of animal anesthesia and critical care. Format is directed by discussion following reading of assigned material emphasizing foundations in pharmacology and physiology. (S/U grading only.)

293. Anesthesia/Critical Care Case Management Conference (1) I, II, III. The Staff (Steffey in charge)
Discussion—1 hour. Prerequisite: postdoctoral, medical or graduate student; consent of instructor. Discussion of Veterinary Medical Teaching Hospital case material to illustrate specific medical problems and their preventive and corrective management. (S/U grading only.)

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 (1 1/2 per week) I, II, III. The Staff (Vasseur in charge)
Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of pet animal patients in the hospital including physical examinations, presurgical work-ups, surgery, postoperative care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

412. Large Animal Surgery (1 1/2 per week) I, II, III. The Staff (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 (1 1/2 per week) I, II, III. The Staff (Steffey in charge)
Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for anesthetic care of patients in the operating rooms under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

420. Veterinary Neurology (1 1/2 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 (3/4-1 1/2 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 (1/2) 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

Textile Science

See Fiber and Polymer Science

Textiles (A Graduate Group)

S. Haig Zeronian, Ph.D., D.Sc., Chairperson of the Group

Group Office, 129 Everson Hall (916-752-6650)

Faculty. The Group includes the faculty from the Division of Textiles and Clothing as well as from a variety of other departments representing related disciplinary fields.

Graduate Study. The Graduate Group in Textiles offers a program of study and research leading to the M.S. degree. Students in the program can emphasize either the physical or behavioral science aspects of textiles. Research areas include: structure, modification, and properties of textiles; and psychological and sociological factors relating to perception and consumption of textiles and apparel. Extensive specialized textiles research facilities are available. For detailed information regarding the program, address the Chairperson of the Group.

Graduate Adviser. S. H. Zeronian (Textiles and Clothing).

Textiles and Clothing

(College of Agricultural and Environmental Sciences)

Margaret H. Rucker, Ph.D., Chairperson of the Division

Division Office, 129 Everson Hall (916-752-6650)

Faculty

You-Lo Hsieh, Ph.D., Associate Professor
Susan B. Kaiser, Ph.D., Associate Professor
Emory Menefee, Ph.D., Adjunct Professor

Mary Ann Morris, Ph.D., Professor Emeritus
 Howard L. Needles, Ph.D., Professor
 Ning Pan, Ph.D., Assistant Professor
 Margaret H. Rucker, Ph.D., Professor
 Howard G. Schutz, Ph.D., Professor
 S. Haig Zeronian, Ph.D., D.Sc., Professor

The Major Program

The textiles and clothing major emphasizes the connections among (a) the physical characteristics of textile products, (b) human perceptions of and behavior toward these products, and (c) global economic trends affecting the textile/apparel marketplace. An integrative knowledge base links textile products with people and processes, to focus on the production, distribution, and consumer use of textiles and apparel.

The Program. The textiles and clothing major offers two options: multidisciplinary and marketing. The *Multidisciplinary* option provides students with a broad knowledge base in both the social and physical sciences. This base includes production, end-use applications and care of textiles and apparel, physical and chemical properties of textiles, and social-psychological and economic aspects of textiles and clothing. The *Marketing* option emphasizes social science and business course work, while also providing students with an awareness of the physical nature of textile products.

Internships and Career Alternatives. Textiles and clothing majors can pursue internships and careers in apparel production and merchandising, retail management, international marketing, textile testing and conservation, and textiles journalism. The majority of textiles and clothing graduates accept entry-level management positions within the textile and apparel industry or in related fields, (e.g., merchandising and marketing, production research and development, technical service and design). Students may also pursue graduate studies in textile, business, and other areas depending on their specific selections of restricted elective coursework.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable.) *Courses shown without parentheses are required.*

UNITS

English Composition Requirement4-12
 See College Requirement0-8
 Rhetoric 14
Preparatory Subject Matter39-41
 Computer science (Agricultural Science and Management 21, Computer Science Engineering 10, or Sociology 40)2-3
 Economic principles (Economics 1A-1B)10
 History of art or cultural anthropology (Anthropology 2, Art 10H)4
 Physics (Physics 10 or Physics 1A)3-4
 Psychology (Psychology 1)4
 Sociology (Sociology 2)4
 Statistics (Statistics 13)4
 Textiles and Clothing (Textiles and Clothing 6, 8)8
Option-Specific Preparatory Subject Matter16-18
Marketing Option18
 Accounting (Economics 11A-11B)8
 Chemistry (Chemistry 10)4
 Mathematics (Mathematics 16A-16B)6
OR
Multidisciplinary Option16
 Chemistry (Chemistry 1A, 1B, 8A, 8B)16
Breadth/General Education6-24
 Satisfaction of General Education requirement

Marketing Option Depth Subject Matter54

Agricultural economics (Agricultural Economics 100A-100B, 106, 136)16
 Social research methods (Sociology 46A or Psychology 41)4
 Statistics (Statistics 103)4
 Psychology (Psychology 145 or 183)4
 Textiles and clothing (Fiber and Polymer Science 110, Textiles and Clothing 107, 162, 162L, 163, 163L, 164, 173, 174, 177)26

Multidisciplinary Option Depth Subject Matter43

Agricultural Economics (Agricultural Economics 112, 113)8
 Design (Design 143)4
 Psychology (Psychology 145 or 183)4
 Textiles and clothing (Fiber and Polymer Science 100, 161, 161L, Textiles and Clothing 107, 162, 162L, 163, 163L, 164, 173, 174, 177)27

Marketing Option Restricted Electives15

Courses selected from the following:
 Agricultural Economics 18, 112, 141M, 142, 155, 157, 171A, 171B, Anthropology 122, 126, Consumer Science 100, Design 143, Economics 101, 121A, 121B, 134, 162, and other relevant course work, Foreign language, a maximum of 15 units, Mathematics 16C, Psychology 145, 183, Sociology 123, 126, 140, 141, 145, Textiles and Clothing 180A, 180B, 220, 230, with consent of instructor, and a maximum of 5 units in either Textiles and Clothing 192 or 199.

Multidisciplinary Option Restricted Electives24

Courses selected from the following:
 Agricultural Economics 18, 141, 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, Foreign Language, a maximum of 15 units, Mathematics 16A, 16B, 16C, Psychology 145, 183, Rhetoric and Communication 42, 130, 136, 140, Sociology 25, 123, 126, 140, 148, 159, 175, Statistics 106, 108; Textiles and Clothing 100, 170, 180A, 180B, 220, 230, with consent of instructor, and a maximum of 5 units in either Textiles and Clothing 192 or 199.

Marketing Option Unrestricted Electives...15-41

Multidisciplinary Option Unrestricted Electives22-50
Total Units for the Degree180

Major Adviser. S.H. Zeronian
Advising Center for the major is located in 129 Everson Hall (916-752-4417).

The Minor Program:

The Division of Textiles and Clothing offers a minor program for non-majors interested in satisfying secondary career objectives. For acceptance into the program see the staff adviser in 129 Everson Hall.

UNITS

Textiles and Clothing18
 One course from Textiles and Clothing 6, 84
 Courses selected from Textiles and Clothing 107, 110, 161-161L, 162-162L, 163-163L, 164, 170, 173, 174, 17714

Minor Adviser. S.H. Zeronian.
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 Science and Design.

Courses in Textiles and Clothing

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing.

Lower Division Courses

- 6. Introduction to Textiles (4) III.** The Staff
 Lecture—3 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized. (CAN H Ec 6)
- 8. The Textile and Apparel Industries (4) I.** Rucker
 Lecture—4 hours. Study of the textile and apparel industries including fashion theory, production, distribution, and consumption of textile goods.
- 92. Internship in Textiles and Clothing (1-12) I, II, III.** The Staff Rucker in charge)
 Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)
- 98. Directed Group Study (1-5) I, II, III.** The Staff Rucker in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)
- 99. Special Study for Lower Division Students (1-5) I, II, III.** The Staff (Rucker in charge)
 (P/NP grading only.)

Upper Division Courses

- 107. Social and Psychological Aspects of Clothing (4) 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 preparation: Anthropology 2 or Sociology 2.
- 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 serviceability, comfort, and appearance.
- 163. Textile Coloration and Finishing (3) I.** Needles
 Lecture—3 hours. Prerequisite: course 6, 110, or Chemistry 8B. Basic principles of textile dyeing, printing, and finishing; color theory; structure, properties, and application of dyes and finishes; factors affecting application and fastness; maintenance of dyed and finished textiles.
- 163L. Textile Coloration and Finishing Laboratory (1) I.** Needles
 Laboratory—3 hours. Prerequisite: course 163 (may be taken concurrently). Demonstrates various aspects of dyeing, printing, and finishing of textile substrates including the effect of fiber and finish type, and physical and chemical variables on dyeing and finishing processes and on the properties of the resultant textile.
- 164. Principles of Apparel Production (3) III.** Hsieh
 Lecture—3 hours. Prerequisite: course 6 or 8. Overview of characteristics, technology, processes, and research in apparel manufacturing industries including study of government statistics, material utilization and fabrication, mechanization, management, and production engineering.
- 171. Clothing Materials Science (4) I.** Hsieh, Pan
 Lecture—3 hours; laboratory/discussion—3 hours. Prerequisite: course 6, 8, and senior standing. The properties, characterization, and performance evaluation

*Course not offered this academic year.

ation of clothing materials and structures for specific functional applications. Principles and methods related to wetting and transport properties, fabric hand and aesthetic properties, clothing comfort, and material and assembly technology.

173. Principles of Fashion Marketing (3) II. Rucker Lecture—3 hours. Prerequisite: course 8, Economics 1A, Agricultural Economics 113 or 136. Study of basic elements of fashion marketing including philosophy and objectives, organization merchandising, pricing, promotion and personnel.

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 (Rucker in charge) Laboratory—6 hours. Prerequisite: senior standing with textile-related major, and consent of instructor. Senior thesis on independent problems. Research begun in course 180A will be continued and completed in course 180B. (Deferred grading only, pending completion of sequence.)

192. Internship in Textiles and Clothing (1-12) I, II, III. The Staff (Rucker in charge) Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)

197T. Tutoring in Textiles and Clothing (1-5) I, II, III. The Staff (Rucker in charge) Discussion-laboratory—3-15 hours. Prerequisite: upper division textiles-related major and consent of instructor. Tutoring of students in Textiles and 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 (Rucker in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Rucker in charge) (P/NP grading only.)

Graduate Courses

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 alternate 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 alternate years.

250A-F. 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 Materials Science and Engineering 250A-F).

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 (Rucker in charge)

Discussion—1 hour. Prerequisite: graduate standing; consent of instructor. Individual faculty members meet with their graduate students. Critical presentations of original research are made by graduate students. Research activities are planned. Discussions are led by major professors for their research groups. (S/U grading only.)

293. Recent Advances in Textiles (3) I. The Staff (Zeronian in charge)

Lecture—3 hours. Prerequisite: two upper division courses in Textiles and Clothing or consent of 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 (Rucker in charge)

299. Research (1-12) I, II, III. The Staff (Rucker in charge) (S/U grading only.)

Urology

See Medicine, School of

Vegetable Crops

(College of Agricultural and Environmental Sciences)

Alan B. Bennett, Ph.D., Chairperson of the Department

Department Office, 152 Hunt Hall (916-752-0516)

Faculty

M. Joseph Ahrens, Ph.D., Lecturer
 Alan B. Bennett, Ph.D., Associate Professor
 Arnold J. Bloom, Ph.D., Associate Professor
 Kent J. Bradford, Ph.D., Professor
 Marita Cantwell, Ph.D., Lecturer
 James F. Harrington, Ph.D., Professor Emeritus
 Louise E. Jackson, Ph.D., Assistant Professor
 Richard A. Jones, Ph.D., Professor
 Oscar A. Lorenz, Ph.D., Professor Emeritus
 James M. Lyons, Ph.D., Professor Emeritus
 Richard W. Michelmore, Ph.D., Associate 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 Emeritus
 Charles M. Rick, Ph.D., Professor Emeritus
 Vincent Rubatzky, Ph.D., Lecturer
 Dina St. Clair, Ph.D., Assistant Professor
 Mikal E. Saltveit, Jr., Ph.D., Associate Professor
 Carol Shennan, Ph.D., Assistant Professor
 Paul G. Smith, Ph.D., Professor Emeritus
 Arthur R. Spurr, Ph.D., Professor Emeritus
 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

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. H. Timm.

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 Vegetable Crops Office, 148 Asmundson Hall.

Lower Division Course

92. Internship in Vegetable Crops (1-6) I, II, III. The Staff (Department Chairperson in charge) Internship—3-36 hours. Work experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maximum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

Upper Division Courses

101. Principles of Vegetable Crops Production (4) III. Jones

Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1C and/or Plant Science 2. Fundamentals of vegetable crop production, handling, processing, utilization and distribution.

***105. Vegetable Biology, Evolution, and Systematics (4)** I. Yoder

Lecture—2 hours; laboratory—6 hours; field trip(s) and written and oral reports. Prerequisite: Biological Sciences 1C; 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. Offered in alternate years.

118. Seed Production, Technology, and Physiology (4) III. Bradford

Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 112; 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.

150. Vegetables in World Food Production Systems (4) II. Shennan

Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Biological Sciences 1C; 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.

190. Topics in Plant Science Research (1) I, II. The Staff

Discussion—1 hour. Prerequisite: undergraduate standing in the plant or biological sciences. Discussion and critique of current research by faculty, graduate students, and undergraduate students. May be repeated for a maximum of 3 units. (P/NP grading only.)

191. Undergraduate Research: Proposal (3) I. The Staff

Lecture—1 hour; discussion—1 hour; independent study—3 hours. Prerequisite: upper division standing and consent of instructor. Faculty sponsor will individually assist each student to define a problem, conduct a literature survey, identify objectives, generate testable hypotheses, design experiments, plan data analysis, prepare a working outline, and write and revise a draft proposal. (P/NP grading only.)

191L. Undergraduate Research: Experiment (1-5) I, II, III. The Staff

Laboratory—3 to 15 hours. Prerequisite: course 191 (may be taken concurrently) and consent of instructor. Experimental testing of the hypothesis developed in course 191. May be repeated for credit. (P/NP grading only.)

192. Internship in Vegetable Crops (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maxi-

mum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

194H. Senior Honors Thesis (1) I, II, III. The Staff Independent study—3 hours. Prerequisite: course 191L and consent of chairperson. Preparation and submission of honors thesis and presentation of the results in a seminar. (P/NP grading only.)

195. Field Study of Vegetable Industry (1) III. Jackson

Field Study. Prerequisite: consent of instructor. Field study illustrating different aspects of California agriculture, including research institutions, farm operations, field stations, Extension Service, marketing, processors, equipment, etc. To be given between winter and spring quarters. Considered a spring course for preenrollment. (P/NP grading only.)

197T. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)

Laboratory—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for upper division students who desire teaching experience. Under supervision students may prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated up to a total of 6 units. (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

212. Postharvest Physiology of Vegetables (4) III. Saltveit and Yang

Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 112 or Plant Science 112. Comparative physiology of harvested vegetables; emphasis on maturation, senescence, compositional changes, physiological disorders and effects of environmental factors. Laboratories stress concepts and research procedures. Offered in alternate years.

220. Biotechnology and Genetics of Crop Improvement (3) I. Michelmoro

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. Michelmoro

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: graduate standing or consent of instructor. Examines both the classical and molecular genetic

information about plant transposable elements. Topics include the discovery, molecular structure, evolutionary significance and practical uses of these fascinating genetic entities. Offered in alternate years.

228. Plant Molecular Biology Laboratory (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. (Same course as Botany 228.)

***230. Selected Methods in Vegetable Research** (3) II. Bennett

Lecture—1 hour; laboratory—6 hours. Prerequisite: one course from Plant Science 102, Botany 111, 112, Biochemistry 101A-101B or 101L. Survey of the theory and practice of certain laboratory methods and techniques used in vegetable/plant research, with emphasis on determination of plant constituents, physiological functions, and cell/tissue culture. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff
Discussion—1 hour. (S/U grading only.)

291. Special Topics in Vegetable Crops (2) I. The Staff (Chairperson in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing. In-depth coverage of selected topics in vegetable crops and related disciplines. Topics and speakers determined by instructor in charge. Assignments include brief evaluation of a lecture, and pertinent narrative or grant proposal. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

300. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)

Tutoring—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for graduate students who desire teaching experience, but who are not teaching assistants. Students under supervision may give lectures, prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated for a total of 6 units. (S/U grading only.)

Veterinary Medicine, School of

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 (916-752-1360)

Courses in Veterinary Medicine

Lower Division Course

92. Internship in Veterinary Science (1-12) I, II, III, summer. Cardinet
Discussion-laboratory—1-4 hours; clinical experience—3-36 hours. Prerequisite: approval of project by faculty sponsor prior to period of internship. Stu-

dents in this program will be under the supervision of faculty in the School of Veterinary Medicine whose expertise is appropriate for the proposed project. (P/NP grading only.)

Upper Division Course

170. Ethics of Animal Use (3) III. Brooks, Dundon, Price

Lecture—3 hours. Prerequisite: one basic course in composition or speech. Applied ethical methodology, respectful of divergent views, for forming personal and professional ethics toward animals. Examination of current ethical codes, case histories and problem areas and pursuit of consensus policy to protect animal and related human values. General Education credit: Civilization and Culture/Non-Introductory; or Contemporary Societies/Non-Introductory.

192. Internship in Veterinary Science (1-12) I, II, III, IV. Cardinet

Discussion-laboratory and clinic—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work experience in Veterinary Medicine. (P/NP grading only.)

Professional Courses

400. Informatics (1.0) I. Cardinet

Discussion—2 hours; laboratory—8 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Acquisition of elementary skills and proficiency in the use of microcomputing will be achieved through the "real time" use of microcomputers within the science laboratories of instruction. (S/U grading only.)

401. Microscopic and Gross Veterinary Anatomy (10.4) I-II. Hyde

Lecture—54 hours; laboratory—50 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Normal interrelationships of structure and function through an integrated presentation of molecular, cellular, tissue, organ, and whole animal structure; principles of developmental biology and organogenesis, and comparative structure of animals and their organ systems. (Deferred grading only, pending completion of two-quarter sequence.)

402A. Systemic Physiology: Gastrointestinal and Cardiovascular Systems (2.9) I. Curry, Heusner

Lecture—22 hours; laboratory—7 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Basic principles of normal physiologic function in the vertebrate gastrointestinal and cardiovascular systems. These principles are essential for understanding of disorders of the gastrointestinal and cardiovascular systems.

402B. Systemic Physiology: Urinary System and Body Fluids (1.7) II. Bruss

Lecture—12 hours; laboratory—5 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides an understanding of the various functions of the kidney and the urinary system; body fluids and acid-base physiology and mammary physiology.

402C. Systemic Physiology: Respiratory System (1.8) II. Jones

Lecture—12 hours; laboratory—6 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a basic understanding of normal physiological function of the vertebrate respiratory system.

403. Physiological Chemistry (6.6) I. Black

Lecture—57 hours; laboratory—9 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Emphasizes biochemical concepts used to analyze problems and evaluate metabolic relationships important in animal health and disease.

404. Fundamentals of Radiography (2.7) II. Morgan
Lecture—23 hours; laboratory—4 three-hour sessions. Prerequisite: second-year standing in School

of Veterinary Medicine. Ionizing radiation and its interaction with matter and biological systems; instrumentation and principles of diagnostic radiology, radiotherapy and nuclear medicine; diagnostic applications of x-rays and basic principles of veterinary radiology.

405. Veterinary Parasitology (3.6) III. Conrad, Boyce

Lecture—26 hours; laboratory—10 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides an understanding of the important biological and clinical aspects of parasites and the disease they cause in animals.

405B. Clinical Veterinary Parasitology (2) III. Boyce and Conrad

Lecture—20 one-hour sessions. Prerequisite: third year standing in the School of Veterinary Medicine. Provides an understanding of the important biological and clinical aspects of parasites and the disease they cause in animals.

406. Principles of Behavior (0.7) I. Hart

Lecture—7 hours. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Overview of animal behavior with relevance to veterinary medicine.

407B. Principles and Techniques of Surgery (2) I. Gourley

Lecture—9 hours; laboratory—9 three-hour sessions; discussion—3 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Continuation of course 407A. Introduces the veterinary student to technical aspects of surgical science. Specific operative procedures performed by the student provide opportunity to learn fundamental skills of asepsis, instrument identification and manipulation, knot tying, hemostasis and tissue dissection.

407C. Surgical Anatomy (1) I. Stover

Laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Study of anatomical topics as applied to selected surgical operations. Topographical features useful to approaching organs and structures described. Tissues and structures basic to surgery emphasized.

408. Nutrition and Nutritional Diseases in Animals (2.9) II. Morris

Lecture—27 hours; laboratory—2 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Principles of nutrition and their application to the solution of nutritional disorders of animals.

409. Epidemiology (1.7) III. Gardner

Lecture—11 hours; discussion—6 hours. Prerequisite: first-year standing in School of Veterinary Medicine. Approved for graduate degree credit. Introduction to epidemiology and its applications in veterinary medicine.

410. Veterinary Toxicology (2.8) III. Mount

Lecture—28 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Approved for graduate degree credit. 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 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnostic, therapeutic and preventive methods for diseases of rabbits, guinea pigs, hamsters and certain related laboratory rodents will be presented to serve the needs of clinical and research veterinarians. Lecture demonstrations with subject species will be provided.

412. Laboratory Animal Medicine (2) III. Brooks

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Prevention, diagnosis and therapy of medical problems in rabbits, guinea pigs, hamsters, mice, rats and other laboratory species. Emphasis will be

placed on animal colony health management technique, and concepts of preventive disease needed by veterinarians in charge of research facilities.

413. Medical Primatology (2) III. Roberts

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Major diseases, medical management and husbandry of captive nonhuman primates. (S/U grading only.)

414A. Principles of Veterinary Pharmacology and Toxicology (2.4) I. Joy

Lecture—22 hours; laboratory—two 3-three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Provides a basic foundation for understanding of pharmacology and toxicology. Introduces principles of pharmacology and begins a consideration of drugs by pharmacological class.

414B. Veterinary Pharmacology (1.8) II. Gird

Lecture—17 hours; laboratory—one 3-hour session. Prerequisite: second year standing in the School of Veterinary Medicine. Presents discussion of the pharmacology of several classes of drugs which are of major importance in veterinary medicine.

414C. Veterinary Toxicology (2.1) III. Mount

Lecture—21 hours. Prerequisite: second year standing in the School of Veterinary Medicine. General principles of toxicology, mechanisms of carcinogens, teratogens, and genetic and immunotoxicants. Course also discusses the biological effects of toxic substances of biological and industrial origins in animals.

415. Management and Disease of Captive Wildlife (2) III. Fowler

Lecture—20 hours. 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. 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. Ramsay

Lecture—20 hours. Prerequisite: third-year veterinary medical student or consent of instructor. Approved for graduate degree credit. Medical and surgical problems of caged birds; handling and restraint, feeding, nutritional and infectious diseases, anesthesia and surgery, plus problems of organ systems.

418. Diseases of Free Living Wildlife (2) II. Fowler

Discussion—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Lectures on the ecology and epidemiology of disease in free-living wild animals including medical management of free-living populations.

419. Virology (2.7) III. Zee, Yilma

Lecture—19 hours; laboratory—8 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the classification, morphology, and the strategy of replication of animal viruses, covering the molecular pathogenesis of animal viruses at the cellular level with emphasis on agents of infectious diseases of animals.

420. Immunology (3.0) III. Gershwin

Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Concepts of Immunology. Emphasis is on the principles of vaccination, responses to pathogenic agents, and the development of hypersensitivity and autoimmune reactions.

421. Principles of Neurosciences (2.7) II. Cummings

Lecture—22 hours; laboratory—5 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. An integrated study of normal neurobiology, neuroanatomy, and neurophysiology, to

enable students to engage in studies of neurologic disorders and clinical neurology.

422. Veterinary Ophthalmology (2.5) II. Bellhorn

Lecture—21 hours; laboratory—4 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Approved for graduate degree credit. 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 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnosis and treatment of commonly encountered eye diseases of small animals and non-domestic animals.

424. Current Topics in Veterinary Oncology (1) III. Theilen, Madewell

Lecture—10 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. 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.

425. Introduction to the Abnormal Musculoskeletal System (3) III. Pool

Lecture—24 hours; laboratory—6 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the principles of orthopedic diseases of animals, including etiology and pathogenesis, basic responses of musculoskeletal tissues to major types of injuries and diseases.

425B. Pulmonary Medicine (2.9) I. George

Lecture—23 hours; laboratory—6 three-hour sessions. 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 hours; laboratory—5 three-hour sessions. 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 hours; laboratory—5 three-hour sessions. 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 Veterinary Anesthesiology and Critical Patient Care (1.7) III. Steffy

Lecture—15 hours; laboratory—2 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Offers basic principles of veterinary anesthesiology including techniques monitoring and management of animals under anesthesia.

427. Equine Internal Medicine (3) II. Madigan

Lecture—30 hours. 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 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Selected topics in surgical diseases of food animals covered in detail. (S/U grading only.)

428L. Food Animal Surgery Laboratory (0.7) III. Smith

Laboratory—7 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine; course 428 (concurrently). Representative surgeries

of food animals performed by groups of students. Limited enrollment. (S/U grading only.)

429A. Herd Health Management of Beef, Cattle, Swine, Sheep, and Goats (4) II. Hjerpe

Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Practical systems for delivering veterinary service to feedlot, cow-calf, stocker, swine, sheep, and goat production units are considered, with emphasis on prevention and control of disease.

429B. Dairy Herd Health Management (4) III. Weaver

Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Practical systems for delivering veterinary services to dairy farms with emphasis on disease prevention and production control. Lectures supplemented with visits to dairy farms to evaluate feeding programs and health management.

430. Principles of Radiology and Radiographic Anatomy (3.0) I-II-III. Koblak

Lecture—26 hours; laboratory—4 three-hour sessions. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Physical principles of x-ray production and x-ray/matter interactions as they pertain to diagnostic medical imaging and radiation safety and normal radiographic anatomy of the skeleton, head, thorax, and abdomen. (Deferred grading only, pending completion of three-quarter sequence.)

431. Endocrinology and Metabolism (2.0) II. Curry

Lecture—20 hours. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a basic understanding of principles of the normal physiological function of the endocrine glands, their hormones, and other factors that affect the regulation of metabolic processes.

433. Veterinary Oncology (1) III. Theilen, Madewell

Lecture—10 hours. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides veterinary students with a background to define the relationships between pathology, hematology, cytology, immunology, and the clinical manifestations of neoplastic diseases in animals.

434. Infectious Diseases (4.5) I. Pedersen

Lecture—45 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Overview of select infectious diseases of companion and food animals.

435. Clinical Hematology and Biochemistry (6.5) I. Zinkl

Lecture—40 hours; discussion—8 hours; laboratory—18 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Knowledge and understanding of normal form and function of the hemolymphatic, exfoliative cytologic, and clinical biochemical systems provide critical information which aids veterinarians in assessing physical status and in understanding the etiopathogenesis of disease.

436. Public Health and Food Safety (2) III. Genigeorgis

Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Introduction to preventive aspects of veterinary medicine as they relate to zoonoses, environmental hygiene and the safety of foods of animal origin.

437A. Issues in Veterinary Medicine: Ethics, Animal Use, Professional Standards, and Communications (0.8) I. Brooks

Discussion—8 hours. Prerequisite: first year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the important responsibilities of veterinarians to society through their role as health care providers.

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—10 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Economically-sound methods for meeting nutrient requirements of feedlot and pasture beef cattle (including computer-assisted methods). Strategies for presenting nutritional and ration-associated diseases of beef cattle.

440. Veterinary Neurology (2.7) III. Holliday

Lecture—21 hours; laboratory—6 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Integrated study of the relationship between neuroanatomy, neurophysiology, neuropathology, and the clinical manifestations of the diagnosis of neurological diseases and the use of the various neurodiagnostic aids.

443. Behavior Clinic (2) I,II,III. Hart

Laboratory—3 hours; discussion—2 hours. Prerequisite: second year standing in the School of Veterinary Medicine and course 458. Clinical training in behavioral therapy. Students work with clients and animal patients through the Behavioral Services Outpatient Clinic. Case record work-ups with selected presentations of cases during discussion sessions.

445B. Small Animal Theriogenology (1.2) III. Feldman

Lecture—12 hours. 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. Bon-Durant

Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Conditions affecting the reproductive system in the cow, sow, ewe, and goat, with emphasis on symptomatology, pathophysiology, treatment, control, prevention, and herd health applications.

445D. Equine Theriogenology (3) II. Hughes

Lecture—20 hours; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Discussion of special problems of equine reproduction with emphasis on methods of diagnosis and interpretation of clinical and laboratory findings.

446A. Reproduction (4.2) II. Stabenfeldt

Lecture—32 hours; laboratory—10 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Structure, function, pathologic, and clinical aspects of reproduction in animals (normal and abnormal).

446B. Small Animal Reproduction (1) III. Feldman

Lecture—7 hours; discussion—1 hour; laboratory—2 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Provides a complete description (history, physical examination, laboratory abnormalities, etc.) of the common abnormalities associated with the genital tract of male and female dogs and cats.

446C. Food Animal Reproduction (1) III. Bon-Durant

Lecture—6 hours; laboratory—4 three-hour sessions. Prerequisite: second-year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Conditions affecting the reproductive system in the cow, sow, ewe, and goat, with emphasis on symptomatology, pathophysiology, treatment, control, prevention, and herd health applications.

446D. Equine Reproduction (1) III. Hughes

Lecture—6 hours; laboratory—4 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Discussion of special problems of equine reproduction with emphasis on methods of diagnosis and the interpretation of clinical and laboratory findings.

451. Veterinary Bacteriology and Mycology (4.9) I. Hirsh

Lecture—34 hours; laboratory—15 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Introduction to the bacterial and fungal agents of animal diseases. Specifically, each microorganism will be discussed with respect to overall significance to animal disease; structural and functional aspects including morphology, cellular composition, and products of medical interest.

452. General Pathology (3.1) I. Moore

Lecture—18 hours; laboratory—13 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Basic principles of disease and in particular the fundamental mechanisms responsible for creating a disease situation. Illustrations of how the application of general pathological principles is used to determine disease pathogenesis and prognosis.

454. Clinical Immunology (2) II. Pedersen

Lecture—14 hours; laboratory—6 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. 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. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. 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 ground-work 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.)

458. Behavioral Therapy (1) III. Hart

Lecture—1 hour. Prerequisite: first-year standing in the School of Veterinary Medicine or consent of instructor. Clinical application of management, conditioning procedures, hormonal manipulation and drug therapy to resolve common behavioral problems of dogs and cats.

459. Systemic Pathology (4.9) II. Dungworth

Lecture—32 hours; laboratory—17 three-hour sessions. Prerequisite: second year standing in the School of Veterinary Medicine. Approved for graduate degree credit. Presents a basic understanding of the pathobiology of major organ systems relevant to a variety of animal species. Emphasis will be on mechanisms of injury, patterns of response to injury and on balance between damage and repair.

460. Emergency and Critical Patient Care (2) III. Haskins

Lecture—20 hours. Prerequisite: third-year standing

in School of Veterinary Medicine. Introduction to the essential and practical concepts of care for emergency and critically ill patients.

461. Small Animal Orthopedics (1.7) II. Wind
Lecture—14 hours; laboratory—3 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Approved for graduate degree credit. Surgical approaches to joints of the shoulder, hip and stifle, and fractures of the humerus, scapula, radius, ulna, pelvis, femur, tibia, and meta carpals/tarsals.

462. Radiographic Diagnosis: Small Animal (2.5) III. Nyland
Lecture—16 hours; 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 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Approved for graduate degree credit. 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. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Applied clinical anesthesiology for junior veterinary students. Special techniques and consideration for anesthetizing a variety of species including horses, swine, ruminants, large non-domestic species, cats and dogs. (S/U grading only.)

467. Small Animal Anesthesiology (1.5) II. Ilkiv
Lecture—15 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Presentation of material which is basic to safe clinical administration of anesthetic drugs to small animals. Clinical applications, indications and contraindications, and methods of use of common anesthetic drugs and techniques will be discussed.

468. Equine Lameness and Radiology (4) III. Meagher, O'Brien, Pool.
Lecture—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Principles in the radiologic diagnosis of conditions that cause lameness in the equine will be emphasized. Methods used in large-animal radiography will be illustrated and latest technique for treating equine lameness will be discussed. Anatomy and pathology of some areas of the musculoskeletal system will also be presented.

468L. Equine Lameness and Radiology (1) III. Meagher, O'Brien, Pool
Laboratory—10 three-hour sessions. Prerequisite: course 468 (concurrently). Priority enrollment for students in equine track; others with consent of instructor. Limited enrollment.

469. Equine Surgery (2) III. Pascoe
Lecture—20 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Designed to allow third-year veterinary students additional training and experience with surgical procedures in the horse.

469L. Equine Surgery Laboratory (1) III. Pascoe
Laboratory—10 three-hour sessions. Prerequisite: course 469 (concurrently). Specific surgical procedures of the horse are demonstrated and performed by students. Participants in the course work in groups of three on rotating basis. Limited enrollment.

470A-470B-470C. Hospital Practices (2-2-2) I-II-III. The Staff (Director Veterinary Medicine Teaching Hospital in charge)
Veterinary clinical practices—40 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Approved for graduate degree credit. 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
Veterinary clinical practices—40 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor (Summer Session students must be enrolled in DVM/MPVM degree program). Clinical training in veterinary medicine. Assignments in the medical and surgical services and clinical diagnostic laboratories of the VM Teaching Hospital with emphasis on small and equine species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

478. Small Animal/Food Animal Practice Clinic (2.5-15) I, II, III, summer. Hjerpe
Veterinary clinical practices—7.5-45 hours per week. Prerequisite: fourth year standing in the School of Veterinary Medicine. Clinical training in veterinary medicine. Students will have assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital with emphasis on small and food animal species. May be repeated for credit. (S/U grading only.) (Deferred grading, pending completion of sequence.)

480A-480B. Clinic Rounds for Freshmen (0.4-0.4) II-III. The Staff (Director Veterinary Medicine Teaching Hospital in charge)
Discussion—eight 1 1/2 hour sessions per year. Prerequisite: first-year standing in School of Veterinary Medicine. Approved for graduate degree credit. 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 Veterinary Medicine Teaching Hospital in charge)
Discussion—twelve 1 1/2 hour sessions. 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.)

483. Pet Loss Support Rounds (1-2) I, II, III, IV. Hart
Discussion-laboratory—3-6 hours. Prerequisite: veterinary student status. Training and experience in responding to pet loss hotline callers who are experiencing grief associated with an animal's death. Students gain proficiency in supportive listening and referral to community resources and increase effectiveness in dealing with upset pet owners. (S/U grading only.)

485. Introduction to Clinical Veterinary Medicine (1) II. Low
Lecture—1 hour. Prerequisite: first year standing in the School of Veterinary Medicine. An introduction to clinical veterinary medicine, and to an understanding of the relationship between basic sciences and clinical veterinary medicine. (S/U grading only.)

Veterinary Microbiology and Immunology

(School of Veterinary Medicine)
Laural J. Gershwin, Chairperson of the Department
Department Office, 2075 Haring Hall (916-752-1400)

Faculty
Alexander A. Ardans, D.V.M., M.S., Professor (Medicine)
Norman F. Baker, D.V.M., Ph.D., Professor Emeritus
Ernst L. Biberstein, D.V.M., Ph.D., Professor Emeritus
Walter M. Boyce, D.V.M., Ph.D., Assistant 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
David A. Ferrick, Ph.D., Assistant Professor
Laurel J. Gershwin, D.V.M., Ph.D., Associate Professor
Sharon K. Hietala, Ph.D., Assistant Professor
(California Veterinary Diagnostic Laboratory)

Dwight C. Hirsh, D.V.M., Ph.D., Professor
Rance B. LeFebvre, Ph.D., Associate Professor
John W. Osebold, D.V.M., Ph.D., Professor Emeritus
Jeffrey L. Stott, Ph.D., Associate Professor
Richard L. Walker, D.V.M., M.P.V.M., Ph.D., Assistant Professor (California Veterinary Diagnostic Laboratory)

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. Ferrick, Gershwin, Stott

Lecture—3 hours alternate weeks with lecture—2 hours and discussion—1 hour. Prerequisite: Biochemistry 101A or the equivalent. Immune response and defenses of host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes. Clinical applications of immune phenomena emphasized.

126L. Immunology Laboratory (2) II. Ferrick
Laboratory—6 hours. Prerequisite: course 126. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms.

127. Medical Bacteria and Fungi (5) III. LeFebvre
Lecture—3 hours; laboratory—6 hours. Prerequisite: general microbiology; 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: Biological Sciences 1B. The nomenclature of human and animal parasites, their general morphology, life cycles, epidemiology, diagnostic techniques, and host-parasite relationships. Individual laboratory studies supplemented with demonstrations.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Gershwin in charge) (P/NP grading only.)

Graduate Courses

***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) II. Stott
Lecture—3 hours. Prerequisite: course 126 or Veterinary Medicine 450 or consent of instructor. Immunoglobulin structure and function, antigenic determinants, complement. Biology of lymphocytes;

cell-mediated immune reactions, immunogenetics, hypersensitivity. Pathogenetic mechanisms in immunological diseases, immunological unresponsiveness, cancer immunology. Dynamics of infection and resistance. Methods in immunochemistry and immunobiology. Offered in alternate years.

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. Yilma, Zee
Seminar—1 hour. A discussion of the current topics in animal virology. (S/U grading only.) (Same course as Microbiology 296.)

293. Seminar in Infectious Diseases (1) I, II, III. Hirsh
Seminar—1 hour. Discussion of current topics and cases of infectious diseases. (S/U grading only.)

294. Seminar in Parasitology (1) III. Boyce, Conrad
Seminar—1 hour. Discussion of current topics in veterinary parasitology and entomology.

296. Microbiological Diagnosis (2-5) I, II, III. Gershwin, Hirsh

Discussion—1 hour; laboratory—5-14 hours. Prerequisite: laboratory course in veterinary or medical microbiology or the equivalent; course 293 (concurrently); consent of Chief of Microbiology, VM Teaching Hospital. Lab diagnosis of infectious diseases involving case work at the VM Teaching Hospital. (S/U grading only.)

298. Group Study (1-5) 1, II, III. The Staff (Gershwin 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 (916-752-1059)

Faculty

Richard A. Becker, Ph.D., Assistant Adjunct Professor
Alan R. Buckpitt, Ph.D., Associate Professor
Gaylord M. Conzelman, Jr., Ph.D., Professor Emeritus
Francis D. Galey, D.V.M., Ph.D., Assistant Professor
(Veterinary Pharmacology and Toxicology, California Veterinary Diagnostic Laboratory)

Shri N. Giri, B.V.Sc., Ph.D., Professor
Arthur D. Jones, Ph.D., Assistant Adjunct Professor
Robert M. Joy, Ph.D., Professor
James B. Knaak, Ph.D., Assistant Adjunct Professor
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., 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. Offered in alternate years.

247. Natural Toxicants (2) III. Segall
Lecture—2 hours. Prerequisite: organic chemistry, Biochemistry 101A-101B, or consent of instructor. Toxicity and metabolism of natural toxicants with emphasis on the toxic plants present in the western United States. General pathways of metabolism plus the relationship between chemical properties and biologic activity of natural toxicants are discussed. Offered in alternate years.

253. Drug Metabolism (2) III. Buckpitt
Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B; consent of instructor. General pathways of drug metabolism and factors influencing the drug metabolism. Emphasis laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in alternate years.

***258. Receptor-Mediated Mechanisms (2) III.** Pessah
Lecture—2 hours. Prerequisite: Pharmacology and Toxicology 201 or the equivalent. Survey of modern methods for studying physiological receptors including radioligand binding analysis, ion transport/flux measurements, receptor solubilization and purification strategies, and molecular cloning. Theoretical concepts of receptor-mediated signal transduction, information processing, and mechanisms of drug/toxicant interactions. Offered in alternate years.

***258L. Laboratory in Receptor Methods (1) III.** Pessah
Laboratory—3 hours. Prerequisite: Biochemistry and Biophysics 101L, or course 258 (may be taken concurrently). Design and practical application of receptor binding techniques including subcellular fractionation, equilibrium and kinetic radioligand binding studies, receptor activation/inhibition studies, isotopic ion flux measurements; and analysis of data. Limited to 12 students. Offered in alternate years.

***260. Toxicologic Pathology (3) III.** Witschi, Wilson
Lecture—3 hour. Prerequisite: courses 201, 202, and 203. Provide introduction to organ system pathology; provide understanding of pathogenesis and significance of chemically induced tissue injury in the various organs of the body. Offered in alternate years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. (S/U grading only.)

297T. Tutoring in Veterinary Pharmacology and Toxicology (1-5) I, II, III. The Staff (Chairperson in Charge)

Students assist in preparation and teaching of courses in Veterinary Pharmacology and Toxicology or other courses offered by the department under direct supervision of the instructor. Designed for graduate or professional students who desire teaching experience. May be repeated for credit up to 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in Charge)
Prerequisite: consent of instructor. Group study in

selected areas of Pharmacology and Toxicology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Course

405. Veterinary Clinical Pharmacology (2) II. Vulliet Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Approved for graduate degree credit. Pharmacological basis of therapeutic use of drugs in domestic animals. Emphasis on selection of most appropriate drug, its dosage form, route of administration and dose for treatment of certain disease conditions. (S/U grading only.)

Viticulture and Enology

(College of Agricultural and Environmental Sciences)

Linda F. Bisson, Ph.D., Chairperson of the Department

Department Office, 1023 Wickson Hall
(916-752-0380)

Faculty

Douglas O. Adams, Ph.D., Assistant Professor
Maynard A. Amerine, Ph.D., Professor Emeritus
Linda F. Bisson, Ph.D., Associate Professor
Roger B. Boulton, Ph.D., Professor (*Viticulture and Enology, Chemical Engineering*)
James A. Cook, Ph.D., Professor Emeritus
Richard E. Kepner, Ph.D., Professor Emeritus (*Chemistry*)

W. Mark Kilewer, Ph.D., Professor
Ralph E. Kunkee, Ph.D., Professor
Lloyd A. Lider, Ph.D., Professor Emeritus
Mark A. Matthews, Ph.D., Associate Professor
Carole P. Meredith, Ph.D., Associate Professor
Janice C. Morrison, Ph.D., Assistant Professor
Ann C. Noble, Ph.D., Professor
Harold P. Olmo, Ph.D., Professor Emeritus
Cornelius S. Ough, D.Sc., Professor
Vernon L. Singleton, Ph.D., Professor Emeritus
M. Andrew Walker, Ph.D., Assistant Professor
Andrew L. Waterhouse, Ph.D., Assistant Professor
Robert J. Weaver, Ph.D., Professor Emeritus
A. Dinsmoor Webb, Ph.D., Professor Emeritus
Larry E. Williams, Ph.D., Associate Professor

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, Chemical Engineering, Ecology, Food Science, Genetics, Horticulture, Microbiology, Plant Biology and Soil Science. For the Ph.D. degree see Agricultural and Environmental Chemistry, Chemical Engineering, Ecology, Food Science, Genetics, Microbiology, Plant Biology, Plant Pathology, and Soil Science.

Courses in Viticulture and Enology

Lower Division Courses

2. Introduction to Viticulture (2) III. Williams Lecture—2 hours. Fundamental principles of biology and culture of the grapevine including taxonomy, morphology, physiology, distribution, domestication, utilization, propagation, production systems, harvesting, and storage and processing of grapes. Successful completion of the course should prepare students for upper division courses in viticulture.

3. Introduction to Wine Making (3) I. Noble; II. Meredith; III. ———

Lecture—3 hours. This broad overview of wines introduces students having a general interest (or potential fermentation science (enology) majors) to history of wine, physiology of alcohol, wine appreciation, viticulture, fermentation, and wines produced in California and other areas of the United States and world.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

101A. Viticultural Practices (2) I. Walker Discussion-laboratory—4 hours. Prerequisite: course 2. Provides the information required to identify the major wine, raisin, and table cultivars grown in California and elsewhere. Also provides experience in vineyard sampling techniques and vine disease identification.

101B. Viticultural Practices (2) II. Kilewer Discussion-laboratory—4 hours. Prerequisite: course 2. Field-oriented experience in the principles and practices of grapevine production, including pruning, propagation, weed identification and control, frost protection, and physical examination of soil profiles and root distribution patterns.

101C. Viticultural Practices (2) III. Walker Discussion-laboratory—4 hours. Prerequisite: course 2. Field-oriented experience in the principles and practices of grapevine production, including vineyard establishment, vine training, trellising, canopy management practices, irrigation and water management, and methods of crop adjustment for improvement of fruit quality.

110. Grapevine Growth and Physiology (3) III. Matthews

Lecture—3 hours. Prerequisite: course 2. Botanical aspects including morphology and domestication will precede lectures covering flower development and energy budget concepts. Impact of physiological variables such as photosynthesis translocation, mineral nutrition, and water relations on fruit ripening and composition will be covered.

111. World Viticulture (3) III. Meredith Lecture—3 hours. Prerequisite: upper division standing. Study of the diversity of viticulture, both geographical and historical. History of grape growing and its spread throughout the world will be covered, along with discussions of current viticultural practices in different parts of the world, including California.

***115. Raisin and Table Grape Production (2) I.** Williams

Lecture—2 hours. Prerequisite: course 2. Overview of the raisin and table grape industries in California and other production areas of the world. Cultural practices associated with raisin and table grape production will also be discussed. Offered in alternate years.

116. Winegrape Production (3) II. Kilewer Lecture—3 hours. Prerequisite: course 2. Covers principles underlying cultural practices associated with winegrape production, including establishing and planting, training, summer and winter pruning, canopy management, irrigation, mineral nutrition, weed control, frost protection, crop regulation, and harvesting.

118. Grapevine Pests, Diseases and Disorders (3) I. Williams

Lecture—3 hours. Prerequisite: course 2. Describes the various pests and diseases of vineyards throughout California. Pest/disease identification and control methods (to include sampling techniques) also will be discussed. Integrated management approach to pest control methods will be emphasized. Offered in alternate years.

123. Analysis of Musts and Wines (3) I. Ough, Waterhouse

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 Environ-

mental Chemistry, Food Science, Horticulture, and Microbiology. Principles of grapejuice and wine analysis, and the reasons for use of each analysis. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical, and biochemical methods.

124. Wine Production (3) I. 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 (4) II. Boulton Lecture—2 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 124. Principles of equilibria and rates of various physical and chemical reactions in wines; treatment of unstable components in wines by adsorption, ion exchange, refrigeration, filtration, and membrane processes.

***127. Wine Aging: Effects and Reactions (1) III.** Lecture—seven 1 1/2 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 (3) III. Lecture—3 hours. Prerequisite: Chemistry 8B; Food Science and Technology 110A. Distillation principles and practices; production technology of brandy, whiskey, rum, vodka, gin, and other distilled beverages; characteristics of raw materials, fermentation, distillation, and aging. Offered in alternate years.

145. Critical Evaluation of Wines of the World (1) III. Noble, Adams, Meredith

Laboratory-discussion—2 hours. Prerequisite: course 125. To analyze critically non-California wine; several vintages of wines from specific regions will be evaluated in weekly meetings. Assigned students will provide reading for each session. Discussion will focus on relating the wine sensory properties to the assigned reading.

***186. Fermentation Science (3) III.** Kunkee, Ogrydzak (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 alternate years.

192. Internship (1-12) I, II, III, summer. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units. Work experience related to Fermentation Science (Enology) or Plant Science (Viticulture) majors. Internships must be approved and supervised by a member of the department or major faculty, but are arranged by the student. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

210. Grape Development and Composition (4) III. Adams, Morrison
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 105, 111, 112; Biochemistry 101A, 101B recommended. Anatomy, physiology and biochemistry of grape berry development, with emphasis on the development of grape composition relevant to wine-making.

***216. Vineyard Establishment and Development (3) I.** Kiewer
Lecture-discussion—2 hours; fieldwork—3 hours. Prerequisite: courses 110, 115 or 116, or consent of instructor. Application of basic knowledge in viticulture, meteorology, soil, water, plant, and biological sciences to establishment and development of vineyards. To prepare a comprehensive feasibility study of suitability of a given piece of property for growing wine, raisin, or table grapes. Offered in alternate years.

217. Microbiology of Wine Production (3) III. Bisson and staff
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 123, 124, Microbiology 3, Biochemistry 101A, and Chemistry 8B; courses 125, 126 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.**
Lecture—3 hours. Prerequisite: Biochemistry 101A, 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 alternate 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. Waterhouse
Discussion—1 1/2 hours, seven to ten weeks. Prerequisite: courses 123, 124, 125, 126. Discussions of previously assigned reading material, usually in the form of two to three reprints. Discussions led by faculty to acquaint students with their current research interests. May be repeated for credit. (S/U grading only.)

297. Tutoring in Viticulture and Enology (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. Student contact primarily in laboratory or discussion sections, and under direction of a faculty member. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

War-Peace Studies

(College of Letters and Science)

The interdisciplinary minor in War-Peace Studies examines the causes and dynamics of intra- and international wars and efforts to prevent and settle such conflicts.

Students in the minor are encouraged to participate in the educational activities of the Davis Program of the UC Institute on Global Conflict and Cooperation (IGCC). For more information on Davis IGCC, call 916-752-6562.

The minor is sponsored by the Department of Sociology, 139 Young Hall. The faculty advisor is Prof. John Lofland, Department of Sociology 102B Young Hall, 916-752-1580.

Minor Program Requirements:

UNITS

War-Peace Studies20
Approaches

One or two courses from the following:
Comparative Literature 157
Economics 120
Physics/Applied Science 137
Political Science 121, 122, 123, 124, 132
Sociology 119

Northern and Western Regions

One or two courses from the following:
History 134A, 137C, 142, 144, 145,
170B, 171B, 173A, 173B, 173C, 174B
Political Science 130, 131, 136

Southern and Eastern Regions

One or two courses from the following:
History 165, 190C, 194C
Political Science 126, 134, 145, 149, 178

Restrictions: No more than two courses from a single department may be offered in satisfaction of the minor requirements.

UC Davis Washington Center

Prof. Bruce W. Jentleson, Director

UC Davis Washington Center, 1300 19th Street, NW,
#300, Washington, D.C. 20036 (202-296-8221)

Information:
UC Davis Washington Center
Internship and Career Center
2nd Floor, South Hall, 916-752-7260

The UC Davis Washington Center began operations in the 1990-91 academic year. Its central objective is to provide students and faculty new and expanded opportunities to enrich their education and research. Its principal activities are an undergraduate academic-internship program and a research program for faculty and graduate students.

Undergraduate Academic Internship Program

The UC Davis Washington Center undergraduate program is open to students from all majors in the Colleges of Letters and Science, Agricultural and Environmental Sciences, and Engineering who have completed 84 units towards graduation. Students earn 12-16 units of academic credit, continue to be registered as full-time students, and fulfill university residency requirements. A GPA of approximately 3.0 is recommended for admission. Applicants also are evaluated based on a written statement, letters of recommendation and personal interviews.

The undergraduate program runs fall and spring quarters, on a 12-13 week "extended quarter" basis. It has three principal components:

- **Internships/Research Projects (6-8 units):** Students work three to four days per week as interns in Congress, federal agencies, interest groups, trade associations, research institutions, the media, museums or in other organizations related to policy, politics, science and culture and geared to the interests and objectives of individual students. Drawing on the internship experience, each student will develop a research project, under the supervision of a member of the faculty.
- **Policy-Process Seminar (3-4 units):** This seminar focuses on a particular area of policy (e.g., foreign policy, science policy, economic policy, agricultural policy) and the key issues, the politics, the principal institutions, and the dynamics of the process within that policy area. In addition to regular instruction, seminars are likely to include guest speakers, observations of congressional committees and federal agencies, and other relevant Washington experiences.
- **Topical Interest Seminar (3-4 units):** This course is of more general interest, designed to draw on some of the unique historical, scientific, cultural and artistic resources of Washington.

Courses are taught by UC Davis faculty in residence, faculty from the UCLA and UC Santa Barbara Washington programs, or visiting faculty from the Washington area.

Financial aid eligibility is maintained, and the aid package can be adjusted to reflect the additional costs of the Program. Some additional financial awards also are offered directly by the Washington Center.

Students live in university-arranged housing, convenient to public transportation. Arrangements also are made to cover health services and other aspects of student life.

The Washington Center also has two positions for graduate students as Graduate Fellows (combination of a predoctoral research fellowship and a teaching assistantship). More information is available from the Washington Center or the Graduate Division.

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. G.E. Fogg (*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 (916-752-1669).

Lower Division Courses

10. Water and Society (3) III. Silk

Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10 or Geology 1. Occurrence, transport and quality of water; the role of water as an essential natural resource in contemporary society. Aspects of the scientific method, including descriptions of natural phenomena, measurement techniques, and predictive models. Supply and use of water for municipalities, agriculture, industry, waste management, fish and wildlife, and recreation. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Physics 10, Geology 1, or Chemistry 10.

41. Ecology of Polluted Waters (3) II. Knight

Lecture—3 hours. Prerequisite: Biological Sciences 1A or the equivalent. Causes and nature of various types of pollution and their effects upon aquatic biota. Particular emphasis on biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life.

92. Water Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Water Science (4) I. Grismer

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A, Physics 5A, and Biological Sciences 1C or Plant Science 2; Chemistry 1B and Physics 5C 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. General Education credit: Nature and Environment Non-Introductory. Recommended GE preparation: Chemistry 10 and Physics 10.

103. Water Quality, Salt Control and Reclamation (4) I. Biggar

Lecture—3 hours; laboratory—3 hours. Prerequisite: course in soil or water chemistry or consent of instructor. Water quality parameters, water analysis and salinity control in relation to soil and plant factors; reclamation of soil and disposal of waste water and their effects on receiving waters; localized and regional river basin problems in relation to salinity control and water quality.

104. Plant-Water-Soil Relationships (4) III. Hsiao

Lecture—3 hours; discussion—1 hour; two mid-quarter examinations to be arranged. Prerequisite: course 100 or the equivalent preparation in elements of water in soil and plants, Soil Science 100 and one additional course in soils or plant physiology; or consent of instructor. Principles of plant interactions with soil and water environments and their applications in crop and environmental management. Including nutrient and water uptake and transport; transpiration; soil processes affecting supplies; deficiencies and plant responses.

110. Irrigation Principles and Practices (3) III. Schwankl

Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 5A; Soil Science 100 recommended. General course for agricultural and engineering students dealing with soil and plant aspects of irrigation and drainage. Soil-water movement and storage, plant responses to irrigation regimes, water use by crops; procedures for determining frequency and depth of irrigation, drainage.

122. Biology of Running Waters (3) I. Knight

Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in biology and junior standing. The study of lotic aquatic animals and plants in relation to their environment; various factors affecting the distribution of freshwater plants and animals is emphasized in a manner particularly suitable for students of freshwater ecology, soil and water science, and renewable natural resources.

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.

141. Hydrology (3) II. Puente

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. Parlange

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.

145. Irrigation and Drainage Systems (4) II. Wal-lender, Grismer, Hills

Lecture—4 hours. Prerequisite: Engineering 103A or course 142. Engineering and scientific principles applied to the design of surface, sprinkle and micro irrigation systems and drainage systems within economic and environmental constraints. Interaction between irrigation and drainage will be emphasized. (Same course as Agricultural Engineering 145.)

149A. Groundwater Hydrology (3) I. The Staff

Lecture—3 hours. Prerequisite: Mathematics 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.

149B. Groundwater Hydrology (3) II. Fogg

Lecture—3 hours; prerequisite: course 149A or Civil Engineering 144. Groundwater geology and chemistry. Physical and chemical processes in contaminant transport, with emphasis on effects of aquifer complexity. Fundamentals of groundwater flow and transport modeling. Geophysical methods in groundwater.

149L. Groundwater Hydrology Laboratory (1) II. Fogg

Laboratory—3 hours. Prerequisite: course 149A or Civil Engineering 144; course 149B (concurrently). Groundwater flow and transport. Processes are illustrated in experiments carried out with lab apparatus, computers, or analytical models. Well-test analysis in non-ideal aquifers, computer modeling of flow and transport, and field-testing of wells.

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 alternate years.

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)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: senior standing. (P/NP grading only.)

Graduate Courses

*200. Modeling of Soil-Water-Plant Continuum (3) III. Hopmans

Lecture—2 hours; discussion—1 hour. Prerequisites: Mathematics 22B, Soil Science 107, knowledge of a programming language. Principles of soil water and solute transport, root water and nutrient uptake. Emphasis on applications of these principles in irrigation water management. Use of computer programming to simulate transport processes in soils and plants. Offered in alternate years.

201. Advanced Plant-Water Relations (3) I. Hsiao

Lecture—3 hours; discussion sessions. Prerequisite: course 104 or Plant Science 101 or Botany 111; 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 (3) III. Parlange

Lecture—3 hours. Prerequisite: Atmospheric Science 105. Radiation and energy balances of water, soil and vegetative surfaces and the effects of wind, temperature, humidity thereon.

*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) III. 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 alternate years.

217. Hydrochemical Models (3) II. Tanji

Lecture—2 hours; laboratory—3 hours. Prerequisite: physical chemistry, calculus and computer programming or consent of instructor. Mathematical and

computer modeling of chemical state variables and terrestrial and aquatic systems. Equilibrium and rate models; transport models; systems assessment and simulations.

222. The Biology of Streams (5) III. Knight
Discussion—2 hours; seminar—1 hour; laboratory—6 hours (includes field trips). Prerequisite: courses in aquatic entomology, limnology, and phycology. Course will relate various environmental factors to the ecology and productivity of flowing freshwater systems. Emphasis is placed on relationships between stream organisms and their environment by means of integrated field and lecture activities. Offered in alternate years.

250. Advanced Soil Physics (3) III. Nielsen
Lecture—3 hours. Prerequisite: Mathematics 22B or consent of instructor; Soil Science 107 and 207 recommended. Theoretical and applied aspects of the simultaneous transport and retention of water, solutes, heat, and gases in unsaturated soils. Miscible and immiscible displacement theories. Emphasis given to current soil physics research topics of general interest in soil, water, and engineering sciences. Offered in alternate years.

255. Analysis of Random Fields (3) III. Puente
Lecture—3 hours. Prerequisite: upper division course in probability and statistics. Covers techniques used to describe random phenomena in two or three dimensions. Of particular interest are covariance and spectrum methods, local averaging, extremes, and interpolation. Course to show applications in water and soil sciences. Offered in alternate 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)

Miguel A. Mariño, Ph.D., Chairperson of the Group
(916-752-0684/0453)

Group Office, 122 Hoagland Hall (916-752-1669)

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. G.E. Fogg (Land, Air and Water Resources), 225 Veihmeyer Hall (916-752-6810).

Wildlife and Fisheries Biology

(College of Agricultural and Environmental Sciences)

Daniel W. Anderson, Ph.D., Chairperson of the Department

Department Office, 66 Briggs Hall (916-752-6586)

Faculty

Daniel W. Anderson, Ph.D., Professor
Louis W. Botsford, Ph.D., Professor
Timothy M. Caro, Ph.D., Assistant Professor
Joseph J. Cech, Jr., Ph.D., Professor
Ronald E. Cole, B.S., Lecturer
Chris 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
Robert G. Schwab, Ph.D., Professor Emeritus
Dirk Van Vuren, Ph.D., Assistant Professor

The Major Program

The wildlife and fisheries biology major deals with the relationships between the needs of people and the requirements of wildlife. Understanding these relationships is vital for the maintenance of ecological diversity, recreational resources, and food supplies for future generations.

The Program. Because of the diversity of problems in the field, emphasis in the major is placed on broad training in biological and physical sciences, with specialization in 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.

Career Alternatives. Positions now held by graduates in this major include wildlife, fisheries, animal control, and resource biologists and managers with local, state and federal agencies. Some graduates are biologists or consultants with private industries such as commercial fishing businesses, electrical utilities, sportsman's clubs, aquaculture operations, and environmental consulting firms. Also, some are veterinarians, medical physicians, and professors/researchers who teach and/or conduct research in academic institutions.

B.S. Major Requirements:

	UNITS
English Composition Requirement	0-8
See College requirement	
Preparatory Subject Matter	56-59
Biological sciences (Biological Sciences 1A, 1B, 1C).....	15
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 5A, 5B, 5C).....	12
Statistics (Statistics 13 or Agricultural Science and Management 150).....	4

*Course not offered this academic year.

Breadth/General Education.....6-24
Satisfaction of General Education requirement.....6-24

Depth Subject Matter.....62-72

Chemistry (Physiological Sciences 101A-101B or Biochemistry and Biophysics 101A-101B).....6-7
Ecology (Environmental Studies 100 or Zoology 125).....3-4
Evolution (Zoology 148 or Genetics 103).....3-4
Genetics (Genetics 100).....4
Physiology (Physiology 110).....5
Vertebrate anatomy (Zoology 105 or Anatomy 100).....4
Wildlife and fisheries (Wildlife and Fisheries Biology 122, 130, 140).....12

Choose one option from the following two:

Option I: Wildlife Biology specialization
Botany (Botany 102 or 108, Botany 117)....9
Statistics (Statistics 104, 106, 108, or 110).....3-4
Wildlife biology (Wildlife and Fisheries Biology 100, 110, 111, 111L).....13

Option II: Fisheries Biology specialization
Aquatic entomology/invertebrate zoology (Entomology 116 or Zoology 112A 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.....17-48

Total Units for the Degree.....180

Major Adviser. Contact Department office (66 Briggs).

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. Wildlife Ecology and Conservation (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Introduction to the ecology and conservation of vertebrates. Complexity and severity of world problems in conserving biological diversity. General Education credit: Nature and Environment/Introductory.

92. Internship (1-6) I, II, III. The Staff (Department Chairperson in charge)

Internship—3-18 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Field Methods in Wildlife Biology (3) III. The Staff

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 alternate years.

110. Mammalian Biology and Ecology (5) III. The Staff

Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or the equivalent; course in ecology recommended. Integrated introduction to the biology and ecology of nondomestic mammals. Emphasis on natural history, taxonomy, geographical-ecological distribution, anatomical-physiological-behavioral adaptations of mammals to their environment, and research-management methodologies.

111. Biology and Management of Wild Birds (3) I.

Anderson, Raveling
Lecture—3 hours. Prerequisite: upper division course in ecology or consent of instructor. Phylogeny, distribution, migration, reproduction, population dynamics, behavior, and physiological ecology of wild birds. Emphasis on adaptations to environments, species interactions, and management considerations. Students who have had Zoology 137 may not receive credit for this course.

111L. Laboratory in Biology and Management of Wild Birds (2) I. Anderson, Raveling

Laboratory—6 hours. Prerequisite: course 111 (may be taken concurrently); consent of instructor. Laboratory exercises in bird species identification, anatomy, molts, age and sex, specialized adaptations, behavior, and research and management techniques.

120. Biology of Fish (3) I. Moyle

Lecture—3 hours. Prerequisite: Biological Sciences 1B. 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 of 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—4 hours. Prerequisite: course 110, 111, or 120; Physiology 110; and Zoology 125. Animal functions, adaptations, and ecological energetics of wildlife. Nutrition, metabolism, and productivity are emphasized as a pattern of relationships for understanding the distribution and abundance of wild ectotherms and endotherms in time and space.

131. Biology and Management of Cervidae (3) III.

Jacobsen
Lecture—2 hours; laboratory—3 hours. Prerequisite: 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 alternate 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 alternate years.

140. Ecology and Evolution of Vertebrate Social Organization (4) II. Lott

Lecture—4 hours. Prerequisite: Biological Sciences 1B or upper division ecology course (Zoology 125 or the equivalent). Spacing competition, cooperation, and grouping of wild vertebrates are described and analyzed as adaptive products of their evolutionary history and ecology. Minimal consideration is given to humans and other primates.

151. Wildlife Ecology (3) I. Van Vuren

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, and 1C, or the equivalent. Population ecology of wild vertebrates, particularly habitat selection, demography, competition, predation, population growth, and regulation set in the context of human-caused degradation of environments in North America.

153. Wildlife Ecotoxicology (4) II. Anderson

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory courses in organic chemistry, ecology, and physiology, or consent of instructor; Environmental Toxicology 101 recommended. Various forms of environmental pollution in relation to fish and wildlife, the effects and mechanisms of pollutants, effects on individuals and systems, laboratory and field ecotoxicology, examples/case histories, philosophical/management considerations. Offered in alternate years.

154. Conservation Biology (3) III. Caro

Lecture—3 hours. Prerequisite: Zoology 125 or Environmental Studies 100. Introduction to conservation biology. Background to the biological issues and controversies surrounding loss of species and habitats.

190. Proseminar in Wildlife and Fisheries Biology (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: upper division standing in biological sciences or consent of instructor. Reports and discussions of recent advances related to wildlife and fisheries biology. May be repeated twice for credit. (P/NP grading only.)

190C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fisheries biology. May be repeated for credit. (P/NP grading only.)

191. Museum Science (2) II. Cole

Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing and consent of instructor. Principles and methods required to preserve and present biological specimens for research, teaching collections, and museums. Offered in alternate years. (P/NP grading only.)

192. Internship (1-12) I, II, III, summer. The Staff (Chairperson in charge)

Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)

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. Preference given to graduate students in wildlife areas of study. (S/U grading only.)

222. Advanced Population Dynamics (3) II. Botsford

Lecture—3 hours. Prerequisite: graduate standing; advanced course in ecology (e.g., 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. The Staff

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Principles and concepts concerning the ecological, behavioral, economic, philosophical, and historical basis of managing wild vertebrates that have become pests.

290. Seminar (1-3) I, II, III. The Staff (Chairperson in charge)

Seminar—1-3 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of wildlife or fisheries biology. Special topic selected for a quarter will vary depending on interests of instructor and students. (S/U grading only)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fishery sciences. May be repeated for credit. (S/U grading only.)

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.)

293. Seminar in Wildlife Disease Ecology (2) III.

Theis (Medical Microbiology) in charge, Raveling Seminar—2 hours. Prerequisite: graduate status or advanced undergraduate in biology; consent of instructor. Presentation and analysis of assigned research papers in wildlife disease ecology related to considerations of habitat quality, population regulation, wildlife management, and/or implications for human or domestic animal health. (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

(College of Letters and Science)

Judith Newton, Ph.D. Program Director
Program Office, 307 Young Hall (916-752-4686)

Committee in Charge

Yvette Flores-Ortiz, Ph.D. (*Chicano Studies*)
Sandra Gilbert, Ph.D. (*English*)
Carole Joffe, Ph.D. (*Sociology, Women's Studies*)
Suad Joseph, Ph.D. (*Anthropology*)
Lata Mani, Ph.D. (*Women's Studies*)
Josephine Miranda (*Academic Peer Adviser*)
Linda A. Morris, Ph.D., ex officio (*English*)
Belinda Robnett, Ph.D. (*Sociology*)
Judith Stacey, Ph.D. (*Sociology, Women's Studies*)
Beverly Tuel (*Administrative Assistant*)

Faculty

Emily Apter, Ph.D., Associate Professor (*French and Italian*)
Cynthia L. Brantley, Ph.D., Associate Professor (*History*)
Angie Chabram, Ph.D., Associate Professor (*Chicano Studies*)
Doris Earnshaw, Ph.D., Lecturer (*Comparative Literature*)
Karen P. Ericksen, Ph.D., Professor (*Psychology*)
Diane Feilmie, Ph.D., Associate Professor (*Sociology*)
Paula Findlen, Ph.D., Assistant Professor (*History*)
Yvette Flores-Ortiz, Ph.D., Assistant Professor (*Chicano Studies*)
Zunilda Gertel, Ph.D., Professor (*Spanish and Classics*)
Sandra Gilbert, Ph.D., Professor (*English*)
Gary Sue Goodman, Ph.D., Lecturer (*Campus Writing Center*)
Inez Hernandez, Ph.D., Assistant Professor (*Native American Studies*)
Sarah B. Hrdy, Ph.D., Professor (*Anthropology*)
Mary Jackman, Ph.D., Professor (*Sociology*)
Carole Joffe, Ph.D., Professor (*Sociology, Women's Studies*)
Suad Joseph, Ph.D., Associate Professor (*Anthropology*)
Cathy Kudlick, Ph.D., Assistant Professor (*History*)
Anna K. Kuhn, Ph.D., Associate Professor (*German*)
Kari Lokke, Ph.D., Assistant Professor (*Comparative Literature*)
Dianne Sachko Macleod, Ph.D., Associate Professor (*Art History*)
Lata Mani, Ph.D., Assistant Professor (*Women's Studies*)
Susan Mann, Ph.D., Professor (*History*)
Sandra J. McPherson, Ph.D., Professor (*English*)
Patricia Moran, Ph.D., Assistant Professor (*English*)
Linda Morris, Ph.D., Senior Lecturer (*English*)
Judith Newton, Ph.D., Associate Professor (*Women's Studies*)
Beatriz M. Pesquera, Ph.D., Assistant Professor (*Sociology, Chicano Studies*)
Michele Praeger, Ph.D., Assistant Professor (*French and Italian*)
Donna Reed, Ph.D., Lecturer (*Comparative Literature*)
Ada Riddell, Ph.D., Professor (*Chicano Studies*)
Belinda Robnett, Assistant Professor (*Sociology*)
Irit Rogoff, Ph.D., Professor (*Art History*)
Lynn Roller, Ph.D., Associate Professor (*Classics*)
Ruth E. Rosen, Ph.D., Associate Professor (*History*)
Vicki L. Ruiz, Ph.D., Associate Professor (*History*)
Stephanie A. Shields, Ph.D., Associate Professor (*Psychology*)
Juliana Schiesari, Ph.D., Associate Professor (*French and Italian*)
Carol Smith, Ph.D., Professor (*Anthropology*)
Barbara Sommer, Ph.D., Lecturer (*Psychology*)
Judith Stacey, Ph.D., Professor (*Sociology, Women's Studies*)
Margit Stange, Ph.D., Assistant Professor (*English*)
Lenora A. Timm, Ph.D., Professor (*Linguistics*)
Patricia Turner, Ph.D., Assistant Professor (*Afro-American Studies*)

Marian B. Ury, Ph.D., Professor (*Comparative Literature*)
Diane Wolf, Ph.D., Assistant Professor (*Sociology*)

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.

The Program. 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, sociology, Asian American studies, Native American studies, textiles and clothing, and other related disciplines. Depending on individual career goals, each student will design a program in consultation with an adviser.

Career Alternatives. 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 to 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 other 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 and gender theory. 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.

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	36
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	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) I, II, III.

Stacey, Joffe, Mani

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 preparation: any introductory GE course in the areas of Civilization and Culture or Contemporary Societies.

60. Introduction to Feminist Theory (4) I. Mani

Lecture-discussion—4 hours. Introduction to the emergence of feminist theory and to key concepts in feminist theorizing. Examination of past and current debates over sexuality, race, identity politics, and the social construction of women's experience.

80. Special Topics in Women's Studies (4) I, II, III.

The Staff

Lecture-discussion—4 hours. In-depth examination of a women's studies topic related to the research interest of the instructor. May be repeated for credit when topic differs. Limited enrollment.

100. Feminist Approaches to Inquiry (4) I. Newton

Lecture-discussion—4 hours. Prerequisite: one course specified for Women's Studies major. Feminist applications and transformations of traditional, disciplinary practices; current issues and methodologies in feminist interdisciplinary work.

102. Colonialism, Nationalism, and Women (4) III.

Mani

Lecture-discussion—4 hours. Prerequisite: one course specified for Women's Studies major. Explores key dimensions of women's relationship to colonialism and nationalism in one or more societies.

Upper Division Courses

190A. Senior Research Seminar I (4) II. J. Stacey

Seminar—4 hours. Prerequisite: twenty units in Women's Studies and consent of instructor. Guided reading, discussion, and writing, culminating in the preparation of a research proposal.

190B. Senior Research Seminar II (4) III. J. Stacey
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

Internship—3-36 hours; written report. Prerequisite: completion of a minimum of 84 units and consent of instructor; enrollment dependent on availability of intern positions with priority to Women's Studies majors. Supervised internship and study in positions/institutional settings dealing with gender-related problems or issues, as for example, a women's center, affirmative action office, advertising agency, or social welfare agency. Final written report on internship experience. (P/NP grading only.)

- 195. Thematic Seminar in Women's Studies (4) I, II, III.** The Staff
Seminar—4 hours. Prerequisite: two course specified for women's studies major. Group study of a topic, issue or area in feminist theory and research involving intensive reading and writing. May be repeated for credit when topic differs. Enrollment limited.
- 197T. Tutoring in Women's Studies (1-4) I, II, III.** The Staff (Director in charge)
Tutoring—3-12 hours. Prerequisite: upper division standing; completion of course to be tutored with grade of A- or better. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, leading discussion groups. (P/NP grading only.)
- 198. Directed Group Study (1-5) I, II, III.** The Staff (Director in charge)
Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates (1-5) I, II, III.** The Staff (Director in charge)
Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Graduate Course

- 200A. Current Issues in Feminist Theory (4) I.** Newton
Seminar—4 hours. Current issues in feminist theory; techniques employed to build feminist theory in various fields.
- 200B. Prolems in Feminist Research (4) III.** Mani
Seminar—4 hours. Prerequisite: course 200A with a grade of B+ or better. Application of feminist theoretical perspectives to the interdisciplinary investigation of a problem or question chosen by the instructor(s). May be repeated for credit when subject area differs.

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 (916-752-1272)

Faculty

- Peter B. Armstrong, Ph.D., Professor
Ronald J. Baskin, Ph.D., Professor
James S. Clegg, Ph.D., Professor
John H. Crowe, Ph.D., Professor
David W. Deamer, Ph.D., Professor
Olaf Eilers, Ph.D., Assistant Professor
Carol A. Erickson, Ph.D., Professor
Robert D. Grey, Ph.D., Professor
Richard K. Grosberg, Ph.D., Associate Professor
Milton Hildebrand, Ph.D., Professor Emeritus
Everett W. Jameson, Jr., Ph.D., Professor Emeritus
William R. Jeffery, Ph.D., Professor
Roger J. Leslie, Ph.D., Assistant Professor
Marc S. Mangel, Ph.D., Professor
Peter R. Marler, Ph.D., Professor
Milton A. Miller, Ph.D., Professor Emeritus
Brian Mulloney, Ph.D., Professor
Jeanette E. Natzie, Ph.D., Assistant Professor
Richard L. Nuccitelli, Ph.D., Professor
Lauren E. Rosenberg, Ph.D., Professor Emeritus
Robert L. Rudd, Ph.D., Professor Emeritus
George W. Salt, Ph.D., Professor Emeritus
Thomas W. Schoener, Ph.D., Professor
Jonathan M. Scholey, Ph.D., Associate Professor
H. Bradley Shaffer, Ph.D., Associate Professor
Arthur M. Shapiro, Ph.D., Professor
Judy Stamps, Ph.D., Professor
Donald R. Strong, Jr., 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., Lecturer Emeritus

The Major Programs

Zoology is the biology of animals from the molecular level up to the ecosystem. It is a field that offers almost limitless opportunities to explore and combine different approaches to animal biology in the field and in the laboratory.

The Program. Zoology majors may earn either a Bachelor of Science or a Bachelor of Arts degree. The requirements for the B.S. include more science courses, such as biochemistry, whereas those for the A.B. degree allow room for more electives within the humanities and social sciences. The A.B. degree is especially appropriate for those students who wish to combine arts or languages with zoology for career preparation in such areas as scientific writing and translating or illustration. The major is structured to ensure breadth of preparation while still allowing individualization of each student's program in accordance with his or her interests. Beyond the basic upper division requirements for biochemistry, genetics, evolution, cell biology, and statistics, elective course work is selected in consultation with the undergraduate adviser.

Choice of College. The Bachelor of Arts and the Bachelor of Arts and Science degrees are 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. The major requirements are the same in each college, but there are differences in the college requirements and policies. See the appropriate college sections in the front of this catalog for more information.

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. Students in the College of Agricultural and Environmental Sciences must accumulate 54 units of upper division courses to graduate.

Internships and Career Alternatives. Many students gain experience in the field through internships in research laboratories in academe or industry, in practices of doctors or veterinarians, or in government agencies. Many zoology majors go on to graduate work in the life sciences as preparation for academic careers. A considerable proportion of the zoology majors on the Davis campus are pre-dental, pre-medical, and pre-veterinary students. Zoology graduates may also go on to careers in wildlife biology and management, in environment assessment, and a wide range of similar fields. Davis graduates are currently serving in research, teaching, management, and policy-making positions in both public and private institutions and agencies in California and throughout the world, including many of the nation's foremost universities and research laboratories.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	41-45
Chemistry 1A, 1B, 8A, 8B.....	16
Biological Sciences 1A, 1B, 1C	15
Mathematics 16A-16B or Statistics 102	4-6
Physics 1A-1B or 5A-5C	6-8
Depth Subject Matter	36
Genetics 100	4
Zoology 130 or 121A-121B.....	4-6
One course from Zoology 148, Genetics 103, Geology 107, 111A, Anthropology 151	3-4
Additional upper division course work in biological science to achieve a total of 36 units or more	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 Major77-81

Recommended

Geology 3; Physics 5B; Biochemistry 101A-101B or Physiological Sciences 101A-101B.

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	54-62
Chemistry 1A, 1B, 1C.....	15
Chemistry 8A-8B or 118A-118B-118C or 128A-128B-128C	6-12
Biological Sciences 1A, 1B, 1C	15
Mathematics 16A-16B or 21A-21B	6-8
Physics 5A, 5B, 5C.....	12
Depth Subject Matter	49
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	18
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 Major103-111

Recommended

Chemistry 5, Mathematics 16C or 21C, Geology 3.

Areas of Study

- Ecology and behavior:* Zoology 125, 147, 149, 155; Environmental Studies 100.
- Systematics, morphology, and natural history:* Zoology 105, 112, 133, 134, 134L, 136, 136L, 137, 137L; Entomology 100.
- Developmental biology:* Zoology 100, 100L, 101.
- 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
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, 115
Environmental Studies 110, 116, 121, 123, 150C, 151, 151L

*Course not offered this academic year.

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 and Immunology 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 regarding graduate study write to the Graduate Adviser, Department of Zoology. See also the Graduate Division section in this catalog.

Graduate Advisers. P.B. Armstrong, C.A. Erickson, M.S. Margel, J.E. Natzie, J.A. Stamps, C.A. Toft.

Courses in Zoology

Lower Division Courses

2. General Zoology

This course has been cancelled and replaced by Biological Sciences 1B.

2L. Laboratory in General Zoology

This course has been cancelled and replaced by Biological Sciences 1B.

*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)

Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the Department of Zoology. Internships supervised by a member of the faculty. (PNP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge) (PNP grading only.)

Upper Division Courses

100. Embryology (4) I. Armstrong; II. The Staff; III. Erickson

Lecture—4 hours. Prerequisite: Biological Sciences 1A, 1B; concurrent enrollment in course 100L. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

100L. Laboratory in Vertebrate Embryology (1) I. Armstrong; II. The Staff; III. Erickson

Laboratory—3 hours. Prerequisite: course 100 (concurrently). Comparative analysis of the embryonic development of vertebrates. (PNP grading only.)

*101. Advanced Developmental Biology (4) II. Erickson, Natzie, Nuccitelli

Lecture—2 hours; laboratory—6 hours; report. Prerequisite: courses 100, 100L; Biochemistry 101A, 101B; consent of instructor. Lectures in modern top-

ics in developmental biology will be followed by sophisticated laboratory exercises that demonstrate lecture topics. Students conduct their own independent studies during last four weeks of quarter. A written report due at end of quarter.

*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 (4) I. The Staff

Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny.

112. Invertebrate Zoology (4) II. Eilers

Lecture—4 hours. Prerequisite: Biological Sciences 1A, 1B; course 112L (concurrently); courses in systematics, ecology, and evolution recommended. Survey of the invertebrate phyla emphasizing aquatic forms and focusing on morphology, development, natural history, and phylogenetic relationships.

112L. Laboratory for Invertebrate Zoology (3) II. Eilers

Discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B; course 112 concurrently. Field and laboratory experience with representative members of the invertebrate phyla discussed in course 112. Emphasis on comparative morphology, natural history, ecology, and behavior of living invertebrates.

121A. Cell Biology (4) I. Nuccitelli

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in biochemistry (may be taken concurrently). An introduction to modern cell biology with emphasis on cell ultrastructure, membranes and organelles, the cytoskeleton, and bioenergetics.

121B. Cell Biology (4) II. Natzie

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in biochemistry; introductory course in genetics recommended. Discussion of modern cell biology with emphasis on the structure of the nucleus, cell cycle, information transfer, the immune system, and cancer cell biology. Students who have had Zoology/Botany 130 may receive only 2 units for course 121B.

121C. Advanced Cell Biology (4) III. Baskin, Scholey
 Lecture—3 hours; extensive reading and research report. Prerequisite: Biochemistry 101B; Mathematics 16B or equivalent. Molecular and biophysical properties of contractile and motile systems.

121L. Cell Biology Laboratory (3) II. L. Crowe

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) II. Benton

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.

125. Animal Ecology (3) I. Toft; II. Mangel and staff; III. Watt

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. General survey of the concepts of animal ecology.

130. Survey of Cell Biology (4) I. Leslie, Theg (Botany)

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B or 128C; introductory course in biochemistry strongly recommended. A survey of cell biology presenting the structure and function of the major cell organelles. Topics discussed include general cell structure, membranes, bioenergetics, motility,

cell synthesis, and cell division. Not open to students who have received credit for course 121A/121B. (Same course as Botany 130.)

*133. Patterns in Vertebrate Biology (3) II.

Lecture—3 hours. Prerequisite: Biological Sciences 1A, 1B. Vertebrate thermoregulation and water balance, circadian and circannual activity, communication, breathing, movements and feeding patterns.

*134. Herpetology (3) III. Shaffer

Lecture—2 hours; term paper. Prerequisite: Biological Sciences 1A, 1B; course 148 recommended. The world-wide diversity of amphibians and reptiles with emphasis on behavior, ecology, functional morphology, and evolutionary history. Offered in alternate years.

*134L. Herpetology Laboratory (2) III. Shaffer

Laboratory—6 hours; two weekend field trips. Prerequisite: Biological Sciences 1A, 1B; course 134 concurrently. Diagnostic characteristics and functional attributes of amphibians and reptiles, emphasizing ecological, biogeographic and phylogenetic patterns. Field trips will acquaint students with techniques for identifying and studying amphibians and reptiles under natural conditions. Offered in alternate years.

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. Marler

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. Marler

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: any one of the following: Biological Sciences 1A, 1B, or 10, Botany 10, Geography 2 or 2G, or Wildlife and Fisheries Biology 10. Biological, physical, and human-related aspects of the ecology of low latitudes. Distribution, numbers, and relationships of tropical organisms. Problems of development and conservation in the context of ecological and evolutionary theory. General Education credit: Nature and Environment/Non-Introductory. Recommended GE preparation: Biological Sciences 10, Botany 10, or Wildlife and Fisheries Biology 10. Offered in alternate years.

*141. Principles of Systematic Zoology (3) III. Shapiro

Lecture—2 hours; biweekly research projects. Prerequisite: Biological Sciences 1B or 1C; course 148 or Genetics 103 recommended. Historical background, philosophical rationale, contemporary approaches, and working rules of animal biosystematics, including International Code of Zoological Nomenclature. Offered in alternate years.

142. Invertebrate Physiology (4) II. Crowe

Lecture—3 hours; term paper; individual conferences. Prerequisite: course 112, Chemistry 1A, 1B, Physics 5C; 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)** I. Mulloney, Wilson
Lecture—3 hours; extensive reading. Prerequisite: Biological Sciences 1A, 1B, 1C; 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
Lecture—1 hour; discussion—1 hour; laboratory—12 hours. Prerequisite: course 143 and consent of instructor; Physics 5C 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)** I. Shapiro
Lecture—3 hours; term paper. Prerequisite: Biological Sciences 1A, 1B. Movements of terrestrial animals. The role of geologic, climatic, and biologic changes in the geographic distribution of animals. Offered in alternate years.
- 148. Animal Phylogeny and Evolution (4)** II. The Staff
Lecture—4 hours. Prerequisite: Biological Sciences 1A, 1B; 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. Offered in alternate years.
- 155. Behavior of Animals (5)** II. Marler, Stamps
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: Biological Sciences 1A, 1B. 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; 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)** I. Deamer; III. Mangel
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)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the Department 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 Modeling (6)** II. Watt
Lecture—1 hour; discussion—1 hour; seminar—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Statistics 106 and 108 or 131A-131B-131C; FORTRAN. Use of statistical analysis of data, mathematical modeling, and computer simulation of the world or regions to provide basis for policy recommendations and new legislation.
- *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 alternate years.
- *205. Pattern Formation (4)** II. Nuccitelli
Lecture—3 hours; term paper. Prerequisite: course 100 or 121A or the equivalent, and consent of instructor. Morphology and mechanism of pattern formation beginning with ooplasmic segregation. Emphasis will be on cell polarity but some multicellular systems will also be covered. Offered in alternate 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 alternate years.
- 208. Molecular Mechanisms in Animal Development (3)** I. Natzle
Lecture—1.5 hours; seminar—1.5 hours. Prerequisite: graduate standing or consent of instructor; introductory background in developmental biology and molecular genetics recommended. Analysis of the molecular mechanisms that control animal development, with a special focus on multiple levels of gene regulation. Experimental systems including *Drosophila*, amphibians, *C. elegans*, and mice will be discussed. Readings will be taken from the current literature.
- *212. Topics in Invertebrate Evolution (2)** III. 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.)
- *223. Modeling in Behavioral and Evolutionary Ecology (3)** II. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 125 or 155, or the equivalent; Mathematics 131 or Statistics 130A, or the equivalent. Advanced course in theoretical behavioral and evolutionary biology to introduce students to methods that can be used to characterize the fitness associated with different behavioral and developmental adaptations. Will enable students to develop and apply models. Offered in alternate years.
- 225. Biology of Fertilization (3)** I. Clark, Hedrick, Meisel, Nuccitelli
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 alternate years.
- 226. Cell and Molecular Biology of Cancer (1)** I. Armstrong
Lecture—2 hours (first five weeks of quarter). Prerequisite: course 100 or one course from courses 121A, 121B, or 130; or Biochemistry 101A-101B or Physiological Sciences 101A-101B. Analysis at the cellular and molecular levels of the regulation of normal and neoplastic growth, tumor dissemination, identification and characterization of oncogenic agents, characterization of oncogenes and anti-oncogenes.
- 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 alternate years.
- 242. Research Conference in Cell Biology (1)** I. Scholey; II. Leslie; 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
Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. An advanced examination of several current problems in neurobiology. Topics will vary in different years; may be repeated for credit. (S/U grading only.) (Same course as Neurobiology 243.)

***254. Ecology of Parasites (2) I. 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 alternate 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, II, III. Erickson, Nuccitelli

Seminar—1 hour. Prerequisite: consent of instructor. Presentation and critique of faculty and graduate student research in developmental biology. Intended primarily for graduate students. (S/U grading only.)

270. Research Conference in Evolutionary Biology (1) I, II. Ellers, Shaffer; III. Shaffer

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. Mul-loney, Wilson

Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in neurobiology. (S/U grading only.) (Same course as Neurobiology 283.)

***287. Seminar in Animal Behavior (2) III. The Staff**

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. Presentation and discussion of faculty and graduate student research in biology. May be repeated for credit. (S/U grading only.)

292. Seminar in Development (2) II. Erickson, Armstrong

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms.

294. Seminar in Animal Ecology (3) III. Toft

Seminar—3 hours. Prerequisite: course 125 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals.

296. Seminar in Geographical Ecology (2) I.

Shapiro

Seminar—2 hours. Prerequisite: course 125 or 148 or 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.)

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 be able to provide evidence of having 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. 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; residing in California during summers and holidays; maintaining active checking or savings accounts in California banks; 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 lives 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 lived. A minor, except a minor alien who is precluded by the Immigration and Naturalization Act 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.

An adult establishes his or her own residence. Residence of an adult is not derived from a spouse or parents.

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. No petitions will be accepted after instruction begins.

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, 300 Lakeside Dr., 7th Floor, Oakland, CA 94612-3565, —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. If the California resident parent(s) of an eligible minor moves from California leaving the minor in the state, the minor will be entitled to resident classification as long as he or she enrolls in an institution within one year of the date the parent(s) established a residence outside of California. This classification will continue until the student has attained the age of majority and has resided in the state the minimum time necessary to become a resident so long as, once enrolled, he or she maintains continuous attendance at an institution.

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, (a) 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 (3) that he or she 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 or adults other than a parent for not less than two years. The adult or adults having such control must have 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. A student who has not been an adult resident of California for more than one year may be entitled to resident classification until he or she has resided in California for the minimum time necessary to become a resident if, (a) he or she is the dependent child of a California parent who has established residence in the state for more than one year immediately prior to the residence determination date, and (b) he or she maintains continuous attendance at an institution.

5. 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 the member of the military (1) is transferred on military orders to a place outside this state where he continues to serve in the armed forces or (2) is retired as an active member of the armed forces immediately after having been on active duty in California, the student is entitled to retain resident classification under conditions set forth above.

6. 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.

7. Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, may be entitled to resident status.

8. 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.

ACCREDITATION

The University of California, Davis is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges, an institutional accrediting body recognized by the Council on Post-secondary Accreditation and the U.S. Department of Education. UC Davis is also accredited by the 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, 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.

GOVERNANCE OF THE UNIVERSITY

Governance of the University is entrusted to a corporation called The Board of Regents. Of the individuals composing the board, 19 are prominent California citizens appointed by the Governor; and seven, including the President of the University and the Governor of California, serve ex officio. A Student Regent is selected each year from a list of names submitted to the board by the Student Body Presidents' Council.

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

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

UNIVERSITY POLICY ON NONDISCRIMINATION, SEXUAL HARASSMENT, STUDENT RECORDS, AND PRIVACY

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 (cancer-related) 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, 525 Mrak Hall, 916-752-2070. Speech and hearing impaired persons may dial (TDD) 916-752-7320.

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 916-752-1128. Copies of the Federal Act, the full text of the UC Policies and the UCD Policy and Procedure Manual, Section 320-21, may be consulted at the Reference Desk of the Shields Library. Copies of the UC policies may be obtained at the Office of Student Judicial Affairs.

Categories of personally identifiable information designated by the campus as public information are: name, address (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.

Parental/guardian information is confidential. It is used by the University only for notification of events, ceremonies, awards, and development or in case of an emergency involving the student.

Students may request in writing by the last day of registration that their addresses and telephone listings or all personally identifiable information from their records not be regarded as public information. Students who desire to withhold their addresses and telephone listings may so indicate on the Student Address Form included with registration materials. Students who desire to withhold all information from the category of public information must file a form in the Registrar's Office.

Students availing themselves of this right should understand what the consequences of such action may be. For example, if all information is designated non-public information, the campus cannot make public any honors received by the student (e.g., the award of a Regents' Scholarship or election to Phi Beta Kappa) and cannot include the student's name and degree earned in the campus commencement program without the student's written consent. Similarly, the student's status as a student cannot be verified for potential employers without the student's written consent. Finally any degrees earned and the dates they were conferred may not be confirmed for any third party in connection with the appointment of that graduate to a new position or published in connection with an honor that individual subsequently receives. Students may reverse the decision to withhold their address and phone number at registration for a new quarter on the Student Address Form. The decision to withhold address and phone number or all information can be reversed at any time by filing a form with the Registrar's Office.

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.

PROPORTION OF UC DAVIS GRADUATES FINDING WORK IN THEIR FIELDS OF CHOICE¹

The percent of alumni whose full-time job is in the field of their choice is shown by field of study. Figures do not include the 13 percent of graduates who had not decided on a career field at the time of the survey.

Field of Study ²											
Animal Science	Applied Economics	Behavioral Science	Food Science	Plant Science	Bio-science	Resource Science	Engi-neering	Humanities	Physical Science	Social Science	Total Percent
61	77	88	90	100	74	69	97	61	80	70	78

¹Source: A 1988 survey of June 1987 graduates conducted by Student Affairs Research and Information, UC Davis.

²Fields of Study are groups of related undergraduate majors; for example, "Animal Science" would include such majors at UC Davis as Animal Science, Avian Sciences, and Wildlife and Fisheries Biology.

RETENTION DATA¹ AND GRADUATION RATES AT UC DAVIS**Freshmen**

(Retention and graduation rates through Spring 1990 for regularly admissible undergraduates entering UC Davis as freshmen.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating in	
			12 Quarters	15 Quarters
1980	2,864	89%	36%	67%
1981	2,609	90%	34%	69%
1982	2,350	91%	38%	73%
1983	2,280	92%	32%	72%
1984	2,780	93%	30%	72%
1985	2,515	92%	30%	63%

Transfer Students

(Retention and graduation rates through Spring 1990 for undergraduates transferring to UC Davis as juniors.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	Percent Graduating in	
			6 Quarters	9 Quarters
1982	633	86%	39%	71%
1983	616	89%	36%	75%
1984	704	89%	35%	72%
1985	629	90%	35%	72%
1986	599	91%	33%	74%
1987	683	91%	27%	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, UC Davis (January 1991).

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	\$2596	\$3040	\$4128
Humanities/ Social Sciences	1821	1981	2619
Health Sciences/Life Sciences	2032	2334	—
Physical Sciences	2046	2443	3289

¹Source: College Placement Council Salary Survey (September 1990).

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

Regents Ex Officio

- Pete Wilson
Governor of California and President of The Regents
- Leo T. McCarthy
Lieutenant Governor of California
- Willie L. Brown, Jr.
Speaker of the Assembly
- Bill Honig
State Superintendent of Public Instruction
- Martha Newkirk
President of the Alumni Association of the University of California
- Walter E. Hoadley
Vice President of the Alumni Association of the University of California
- David Pierpont Gardner
President of the University
- Ralph Ochoa
Gail Anderson

Appointed Regents

(Current term expires on March 1 of year indicated)

- William T. Bagley (2002)
Roy T. Brophy (1998)
Clair W. Burgener (2000)
Yvonne Brathwaite Burke (1993)
Glenn Campbell (1996)
Frank W. Clark, Jr. (2000)
Alice J. Gonzales (1998)
S. Sue Johnson (2002)
Tirso del Junco, M.D. (1997)
Jeremiah F. Hallisey (1993)
Meredith J. Khachigian (2001)
Leo S. Kolligian (1997)
Howard H. Leach (2001)
S. Stephen Nakashima (1992)
Yori Wada (1992)
Dean A. Watkins (1996)
Harold M. Williams (1994)
Jacques S. Yeager (1994)

Student Regent

- Diana Darnell (June 30, 1992)
(UCSF)

Faculty Representatives

- Carlton Bovell
Fred N. Spiess

Principal Officers of The Regents

- James E. Holst
General Counsel
- Herbert M. Gordon
Treasurer
- Bonnie M. Smotony
Secretary

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

- David Pierpont Gardner
President of the University
- William R. Frazer
Senior Vice President—Academic Affairs
- Ronald W. Brady
Senior Vice President—Administration
- William B. Baker
Vice President—Budget and University Relations

- Cornelius L. Hopper, M.D.
Vice President—Health Affairs

- Kenneth R. Farrell
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Index

Academic calendar, 5

Academic credit, 57

Academic options program, 48

Academic Reentry Program, 28, 49
(see also Reentry Student Services)

Accreditation, 370

Adding courses, 56

Address directory, 4

Administrative officers, 373-374

Admission

acceptance, 24

application filing and fees, 21

checklist, 29

deadlines, 21

entrance requirements, 22-25

by examination, 24

as a freshman, 21-24

to graduate study, 85

as an international student, 27

notification, 24

out-of-state applicant, 24

preparing for university work, 21

to professional school, 89-90

(Law), 93 (Management), 95-96

(Medicine), 99-100 (Veterinary
Medicine)

selection criteria, 27-28

special status, 29

as a transfer student, 26

visiting the campus, 12

Adult Fitness Program, 16

Advanced Placement Examinations,
24-25

Advising, 45-49

academic, 46-47 (Agricultural and
Environmental Sciences), 47

(Engineering), 47-48 (Letters

and Science), preprofessional, 49

Advising Services, 49

Aeronautical Science and Engineering,
172, 173, 195-196, 198-199

Aerospace Studies (Air Force), 294

Affirmative Action, 28, 49, 50

Afro-American Studies, 104

Agrarian Studies, 105

Agricultural and Environmental Chemistry
(A Graduate Group), 105

Agricultural and Environmental Sciences,
College of, 12-13

Agricultural and Managerial Economics,
105-106

Agricultural Economics, 106-109

Agricultural Education, 109-110

Agricultural Engineering, 110, 172,
173-174, 180-181

Agricultural Engineering Technology,
110-111

Agricultural History Center, 15

Agricultural Practices, 111

Agricultural Science and Management,
111-112

Agronomy, 112-113

Agronomy and Range Science, 113
(see also Range Science)

Allergy (see Rheumatology-Allergy)

Alumni Association, 44

American History and Institutions require-
ment, 69

American Studies, 113-114

Anatomy, Department of (Veterinary
Medicine), 114

(see also Cell Biology and Human Anato-
my)

Anesthesiology, 272-273

Animal Behavior (A Graduate Group), 115

Animal Genetics, 115

Animal Nutrition (see Nutrition)

Animal Physiology, 115-116

Animal Science, 116-118

Animal Surgery Laboratory, 17

Anthropology, 118-122

Application filing and fees, 21

Applied Behavioral Sciences, 122-124

Applied Mathematics (A Graduate Group),
124-125

Applied Physics (see Physics)

Applied Science Engineering, 181-184

Aquaculture (see Agricultural Engineering
Technology; Animal Science; Wildlife and
Fisheries Biology)

Arboretum, University, 15

Archaeology (see Anthropology)

Architecture (see Art History; Landscape
Architecture)

Area requirement, 80-82

Art History, 125-127

Art Studio, 127-128

Arts at Davis, 40-43

Asian American Studies, 128-129

Asian Studies (see Asian American
Studies; East Asian Studies)

Associate Dean of Students, 51

Associated Students (ASUCD), 43

Astronomy, 311

ASUCD, 43

Athletics, 41-42 (see also Physical
Education)

Atmospheric Science, 129-131

Atmospheric Science (A Graduate Group),
131

Avian Medicine (see Epidemiology and
Preventive Medicine)

Avian Sciences, 131-133

Avian Sciences (A Graduate Group), 133

Bachelor's degree

requirements, 68

second baccalaureate, 29

Bacteriology (see Microbiology)

Basement Gallery, 43

Bicycles, 10, 31

Biochemistry, 133

Biochemistry and Biophysics, 133-134

Biochemistry and Molecular Biology

(A Graduate Group), 134-135

Biochemistry and Special Instrumentation
Laboratory, 17

Biological Chemistry, 273

Biological Sciences, 48, 135-137

Biomedical Engineering (A Graduate
Group), 137

Biophysics (A Graduate Group), 137
(see also Biochemistry and Biophysics)

Black studies (see Afro-American Studies)

Bodega Marine Laboratory, 16-17

Bodega Marine Reserve, 16-17

Botany, 137-140

Botany (A Graduate Group), 140

Buses, 39

Cal Aggie Marching Band, 44

Calendar, 5 (academic), 91 (Law), 97

(Medicine), 101 (Veterinary Medicine)

California Agricultural Experiment Station, 15

California Articulation Number Courses, 103

California Primate Research Center, 17

Campus tours, 12

Candidacy, filing for, 5, 70

Cantonese, 129

(see also Asian American Studies)

Cardiology, 278

Career Planning and Placement (see Intern-
ship and Career Center)

Carnegie unit, 57

Carpooling, 39

Cell and Developmental Biology

(A Graduate Group), 140-141

Cell Biology and Human Anatomy, 273-274

Certificate program for engineers, 87

Chancellors, 373

Chemical Engineering, 172, 173, 184-185

Chemistry, 141-144

(see also Agricultural and Environmental
Chemistry)

Chicano Studies, 144-145

Child Care Programs, 38

Child Development (A Graduate Group),

145 (see also Human Development)

Chinese and Japanese, 145-147

(see also Asian American Studies;
East Asian Studies)

Civil Engineering, 172, 175-176, 185-189

Class level, 55

Classics, 147-149

Clinical Nutrition and Metabolism, 278

Clinical Pathology, 149-150

Clinical Psychology, 274

Communication (see Rhetoric and
Communication)

Community Development (A Graduate
Group), 150 (see also Applied
Behavioral Sciences)

Community Health, 274-275

Community Housing Office, 37-38

Community Nutrition, 150

Comparative Literature, 151-153

Comparative Literature (A Graduate

Group), 153

Comparative Pathology (A Graduate

Group), 153

Computer Science, 153-154, 172, 174-175,

177, 193-195

Computer Science (A Graduate Group),
154

Computing Services, 15

- Concurrent credit, 57–58
 Concurrent enrollment, 28
 Consumer Economics, 154
 Consumer Food Science, 154
 Consumer Research, Center for, 19
 Consumer Science, 155
 Consumer Technology, 155
 Counseling (see Advising)
 Counseling Center, 51
Courses
 adding and dropping, 56
 alternate year designation, 103
 CAN, 103
 classification and numbering, 55–56
 credit for (units), 57
 enrollment in, 55
 expanded descriptions, 103
 grading, 61–63
 load, 56
 prerequisites, 56
 repetition of, 62–63
 Craft Center, 41
 Credit by examination, 57
 Critical Theory, 155
 Crocker Nuclear Laboratory, 18
 Cultural Days, 44
- D**ance (see Physical Education)
 Davis, campus and community, 10–12
 Degree check, 78, 82
 Degree requirement changes, 75, 78, 82
 Degree requirements
 Agricultural and Environmental Sciences, College of, 74–75
 Engineering, College of, 75–78
 Graduate Division, 85–86
 Letters and Science, College of, 79–82
 Veterinary Medicine, School of, 100–101
 Degrees offered by UC Davis, 6–7
 Dermatology, 275
 Designated Emphasis, 86
 Design, 156–157
 (see also Art; Landscape Architecture)
 Design Gallery, 43
 Dietetics, 157
 Disability Resource Center, 52
 Disclosures from student records, 371
 Discrimination, University policy prohibiting, 370–371
 Dismissal, 65–66
 Disqualification, 65
 Dorms, 37
 Draft information, 52
 Dramatic Art, 42, 158–159
 Dropping courses, 56
- E**arly Childhood Laboratory, 19, 38
 Earth Sciences and Resources
 (A Graduate Group), 159–160
 East Asian Studies, 160–161
 Ecology (A Graduate Group), 161–162
 Ecology, Institute of, 15
 Economics, 162–165
 (see also Agricultural Economics;
 Applied Economics; Consumer Economics)
 Economy, Justice, and Society, 165
 Education, 165–168
 (see also Agricultural Education;
 Applied Behavioral Sciences;
 Human Development)
 Education, Master of, graduate group, 264
 Education Abroad Program, 22, 168–171
 Education and Graduate Placement Services, 53
 Educational Opportunity Program (EOP), 28, 32, 49, 50
 Electrical and computer science engineering, 172–173, 176–177, 189–195
 Electron Microscopy Laboratory, 17–18
 Emergency Medicine, 278
 Employment, student, 35, 38, 39
 Endocrinology and Metabolism, 278–279
 Endocrinology (A Graduate Group), 171–172
 Engineering, College of, 13–14, 172–200
 Aeronautical Science and, 172, 173, 195–196, 198–199
 Agricultural, 172, 173–174, 180–181
 Applied Science, 181–184
 Chemical, 172, 173, 184–185
 Civil, 172, 175–176, 185–189
 Computer Science, 172, 174–175, 177, 193–195
 Electrical and Computer Science, 172–173, 176–177, 189–195
 Materials Science and, 172, 177–178, 195–196, 199–200
 Mechanical, 172, 178–179, 195–198
 Engineering design requirement, 76
 Engineering electives, 76–78
 English, 200–205
 English composition examination, 74, 80
 English composition requirement, 74, 76, 80
 English proficiency requirement, 22
 Enology (Viticulture and Enology), 357–358
 Entomology, 205–207
 Environmental Biology and Management, 207–208
 Environmental Design, 208
 Environmental Geology, 208–209
 Environmental Health Research, Institute for, (see Toxicology and Environmental Health, Institute of)
 Environmental Horticulture, 209–210
 Environmental Planning and Management (see Environmental Biology and Management; Environmental Horticulture)
 Environmental Policy Analysis and Planning, 210–211
 Environmental Studies, 211–213
 Environmental Toxicology, 213–214
 EOP/SAA, 28, 33, 49, 50
 Epidemiology and Preventive Medicine, 214–216
 Equestrian Center, 40
 Events and information, campus, 40
 Examinations
 Advanced Placement, 24–25
 credit by, 57
 final, 60–61
 High School Proficiency, 24
 midterm, 60
 requirement (ACT and SAT), 23
 Expenses
 annual, 31
 housing, 37
 Exploratory program, 47
 Extension courses (see University Extension)
- F**acility for Advanced Instrumentation, 18
 Family Practice, 275–276
Fee
 employee-student, 31
 exceptions, 31
 refunds, 32
 Fees and expenses, 31–32
 Fellowships, 86
 Feminist Theory and Research, 216
 Fermentation Science, 216
 Fiber and Polymer Science, 216–217
 Financial aid, 32–35, 38
 Fine Arts Collection, 43
 First Resort, The, 48–49
 Fisheries (see Animal Science; Wildlife and Fisheries Biology)
 Floriculture (see Plant Science major)
 Food Biochemistry, 217–218
 Food Engineering, 174
 Food Intake Laboratory, 17
 Food Science, 218
 Food Science (A Graduate Group), 218
 Food Science and Technology, 218–220
 Food Service Management, 220
 Footnotes, key to symbols, 103
 Foreign language requirement, 81–82
 Foreign students (see International student)
 Forest Engineering, 174
 French, 220–223
 Freshman Seminar Program, 223
- G**ames Area, 40
 Gastroenterology, 279
 General Education Requirement, 70–73, 74 (Agricultural and Environmental Sciences), 77–78 (Engineering), 80–81 (Letters and Science)
 General Education courses for 1991–92, 73
 General Education Preparation List, 72
 General Medicine, 279
 Genetics, 223–225
 Genetics (A Graduate Group), 225
 Geography, 225–228
 Geology, 228–232
 Geophysics, 232
 Geotechnical Modeling, Center for, 18
 German, 232–236
 Gorman Museum, 43
 Governmental Affairs, Institute of, 19
 Grade point average (GPA), 61
 Grades, 61–63
 change of, 62
 final, 63
 incomplete, 62
 in-progress, 62
 Passed/Not Passed, 61

repeated course, 62–63
 Satisfactory/Unsatisfactory, 62
Graduate
 admission, 85
 advising, 49
 certificate program for engineers, 87
 deadlines, 84
 degrees, 85–86
 Division, 83–87
 fees and expenses, 31
 placement services, 53
 program of study, 85
 Student Association, 43–44
 Graduates, proportion finding work in their field of study, 372
Graduation
 filing for, 5, 70
 honors, 63–64
 rates, 372
 Grants, 33
 Greek, 148–149
 (see also Classics)
 Grievances, resolving, 50–51

Handicapped Students, services to,
 (see Disability Resource Center)

Health
 education, 51
 insurance, 31, 38
 Sciences Advising Office, 49
 services, 37–38, 51
 Health Sciences Research Labs, 17–18
 Hebrew, 330
 (see also Religious Studies)
 Hematology-Oncology, 279
 Herbarium, J.M. Tucker, 16
 High school proficiency examination, 24
 History, 236–242
 History, Art, 125–127
 History and Philosophy of Science, 242
 Home Economics, 242
 (see also Agricultural Education)
 Honorary societies, 64
 Honors and Prizes, 63–64
 Horticulture (A Graduate Group), 243
 (see also Environmental Horticulture)
 House, The, 51
 Housing, 37
 Human Anatomy (see Cell Biology and Human Anatomy)
 Human Corps Program, 53
 Human Development, 243–245
 Human Performance Laboratory, 18
 Human Physiology, 276–277
 Humanities, 245
 Humanities Institute, 19

Immunology (A Graduate Group), 245–246
 (see also Veterinary Microbiology and Immunology)
 Independent Study Program, 246
 Individual major, 59, 70, 246
 Infectious Diseases, 279–280
 Integrated Studies Program, 246–247
 Intercampus exchange program, 86
 Intercampus Institute for Research

at Particle Accelerators, 19
 Intercollegiate athletics, 41–42
 Internal Medicine, 277–281
 International Agricultural Development, 247–249
 International Agricultural Development (A Graduate Group), 249
 International Relations Program, 249–250
 International student
 admission, undergraduate, 27
 admission to Graduate Division, 85
 expenses, 31–32
 Services, 51–52
 Internship and Career Center, 53
 Internship Program, 53, 250
 Intramurals and club sports, 41
 Irrigation (see Engineering: Civil; Soil and Water Science)
 Italian, 250–252

Japanese, 146–147
 Jepson Prairie Reserve, 16
 Judicial Affairs, 44

Kids On Kampus, 38

Land, Air and Water Resources, 252
 Landscape Architecture, 252–254
 Latin, 149
 (see also Classics)
Law
 combined degree program, 91
 School Admission Test (LSAT), 89
 School of, 89–91, 254–259
 Learning Skills Center, 49–50
 Learning Resources Center, 50
 Leave of absence, 64–65
 Letters and Science, College of, 14
 Library, University, 15
 Limited status, 28–29
 Linguistics, 259–261
 Linguistics (A Graduate Group), 261
 Literature in Translation, 261–262
 Living accommodations, 37–38
 Loans, 33–34

Majors
 change of, 58
 cross-college, 59
 declaration of, 58
 degree certification, 70, 74
 individual, 59, 72
 list of, 6–7
 multiple, 58–59, 72
 Management, Graduate School of, 92–93, 262–264
 Mann Laboratory, 16
 Marine Resources, Institute of, 18
 Master of Education (A Graduate Group), 264
 Materials Science and Engineering, 172, 177–178, 195–196, 199–200
 Mathematics, 264–268
 Mechanical Engineering, 172, 178–179,

195–198
 Medical Microbiology, 281
 Medical Pharmacology and Toxicology, 281–182
 Medical Sciences, 272
 Medicine, Department of (Veterinary Medicine), 289–290
 Medicine, School of, 94–97, 268–289
 Medieval Studies, 290
 Memorial Union, 40
 Memorial Union Art Gallery, 40, 42
 Mexican-American (Chicano) Studies
 (see Chicano Studies)
 Microbiology, 290–292
 (see also Medical Microbiology; Veterinary Microbiology and Immunology)
 Microbiology (A Graduate Group), 292
 Military Science, 293–294
 Minimum progress, 56, 65–66
 Minor programs, 8, 59–60
 Music, 40, 42, 294–297

Name change, 55
 Native American Studies, 297–299
 Nelson Gallery, 42–43
 Nematology, 299
 Nephrology, 280
 Neurobiology (A Graduate Group), 299
 Neurology, 282–283
 Neurosurgery, 283
 Nondiscrimination, 370–371
 Nuclear Magnetic Resonance Facility, 19
 Nutrition, 300–302
 Nutrition (A Graduate Group), 302
 Nutrition (Medicine, see Clinical Nutrition and Metabolism)
 Nutrition Science, 302

Obstetrics and Gynecology, 283–284
 Occupational and Environmental Health, 280
 Ophthalmology, 284
 Organizational Studies, 337–338
 Orientation, 47, 49, 302
 Orthopaedic Surgery, 284
 Otolaryngology, 284–285
 Outdoor Adventures, 40

Parking Services, 39
 Part-time status, 57
 Pathology (Medicine), 285
 Pathology (Veterinary Medicine), 302–303
 Pediatrics, 285–286
 PELP, 65
 Perfect Tender, The, 38
 Pharmacology (see Medical Pharmacology and Toxicology)
 Pharmacology and Toxicology (A Graduate Group), 303
 Philosophy, 304–306
 Physical Education, 306–309
 Physical Medicine and Rehabilitation, 286
 Physics, 310–313
 Physiological Sciences, 313

Physiology, 313–316
 (see also Animal Physiology; Human Physiology; Plant Physiology)
 Physiology (A Graduate Group), 316
 Planned Educational Leave Program, 65
 Plant Biology (A Graduate Group), 316
 Plant Pathology, 316–317
 Plant Physiology (A Graduate Group), 317
 (see also Plant Biology)
 Plant Protection and Pest Management (A Graduate Group), 317–318
 Plant Science, 318–319
 Plastic Surgery, 287
 Political Science, 320–324
 Pomology, 324–325
 Portuguese, 343
 Preventive Veterinary Medicine (A Graduate Group), 325
 Primate Research Center, California, 17
 Principles of Community, 11
 Privacy Act, 371
 Probation, 65–66
 Proficiency examination, high school, 24
 Protein Structure Laboratory, 17
 Psychiatry, 287
 Psychology, 325–328
 Pulmonary Medicine, 280
 Putah Creek Campus Reserve, 16
 Putah Creek Lodge, 40

Quarters

explanatory note, 103
 how to convert units, 57

Radiation Oncology, 287

Radiological Sciences, 328

Radiology

Diagnostic, 287–288
 Nuclear Medicine, 288

Range and Wildlands Science, 329

Range Science, 329

Readmission

after an absence, 28
 in graduate standing, 85
 (see also Academic Reentry Program)

Records, disclosures from, 370–371

Recreation Hall, 41

Recreation Swimming Pool, 40

Recreational facilities and programs, 39–43

Reentry Student Services, 52

(see also Academic Reentry Program)

Refunds, fee, 32

Regents, 370, 373–374

Register, Statement of Intent to, 24

Registration procedures, 55

Registration Fee Child Care Subsidy Program, 38

Religious Studies Program, 330–331

Repeated courses, 62–63

Reproduction (Veterinary Medicine), 331

Requirements, bachelor's degree, 67–79

Residence halls, 37

Residence requirement, 69–70, 76, 80, 369–370

Resource Sciences, 331–332

Retention data, 372

Rhetoric and Communication, 332–324

Rheumatology-Allergy, 280–281

Ridesharing, 39

ROTC (see Military Science), 294

Russian, 335–337

Satisfactory academic progress, 56, 65–66

Scandinavian, 337

Scholarship deficiencies, 65–66

Scholarship requirement, 22–23, 70, 74, 76, 80

Scholarships, 35

Serology Laboratory, 18

Sexual harassment, policy against, 370–371

Silo Union, 40–41

Social Science Data Service, 19

Sociology, 337–341

Soil and Water Science, 341

Soil Science, 341–342

Soil Science (A Graduate Group), 342

Spanish, 342–346

Special Transitional Enrichment Program (STEP), 50

Speech (see Rhetoric and Communication)

Spirit Squad, 44

Statement on Legal Residence, 369–370

Statistics, 346–348

Statistics (A Graduate Group), 348–349

Stebbins Cold Canyon Reserve, 16

STEP, 50

Student

Activities, 44

Affirmative Action, 28, 49, 50

conduct and discipline, 44

employment, 35, 39

Experimental Farm, 16

family housing, 37

government, 43

health services, 37

housing, 37

judicial affairs, 50–51

records, disclosures from, 371

services, 51–52

Special Services, 52–53

Study plan approval, 74

Subject A, 68

Subject requirements, 22

Summer Advising, 49

Summer Sessions, 66, 70

Surgery (Medicine), 288–289

Surgery, (Veterinary Medicine), 349

Sustainable Agriculture Program, 16

Swedish, 337

Swimming pools, 39–41

Teacher Credential Program, 87

Textile Science (see Fiber and Polymer Science)

Textiles (A Graduate Group), 349

Textiles and Clothing, 349–351

(see also Fiber and Polymer Science)

Theoretical Dynamics, Institute of, 18

Tours, 12

Toxicology (see Environmental

Toxicology; Veterinary Pharmacology and

Toxicology)

Toxicology and Environmental Health, Institute of, 15

Transcripts, 63

Transfer

admission, 26, 28

credit, 24, 26, 70, 80

intercampus, 26

scholastic deficiencies, 66

Student Services, 52

to College of Engineering, 26

Transportation and Parking, 39

Tuition, 31, 369–370

UC Agricultural Issues Center, 16

UC Davis Presents, 40

UC Davis Washington Center, 358

Units

limitations, 56, 79–80

quarter to semester, 57

requirements, 69, 74, 75, 79

value, 57

UNITRANS, 39

University

Arboretum, 15

Extension, 70, 74, 75, 80

Library, 15

of California, 12

Urology, 289

Variable-unit courses, 55

Vegetable Crops, 351–352

Veterans affairs, 53

Veterinary Medicine, School of, 98–101, 352–355

Veterinary Medicine Teaching and Research Center, 18

Veterinary Microbiology and Immunology, 355–356 (see also Microbiology)

Veterinary Pharmacology and Toxicology, 356

Viticulture and Enology, 357–358

War-Peace Studies, 358

Washington Center, 358

Water Resources Center, 16

Water Science, 358–360

Water Science (A Graduate Group), 360

Wildlife and Fisheries Biology, 360–361

Withdrawals, 64–65

Women's Resources and Research Center, 38, 53

Women's Studies Program, 361–363

Work-learn (see Internship and Career Center)

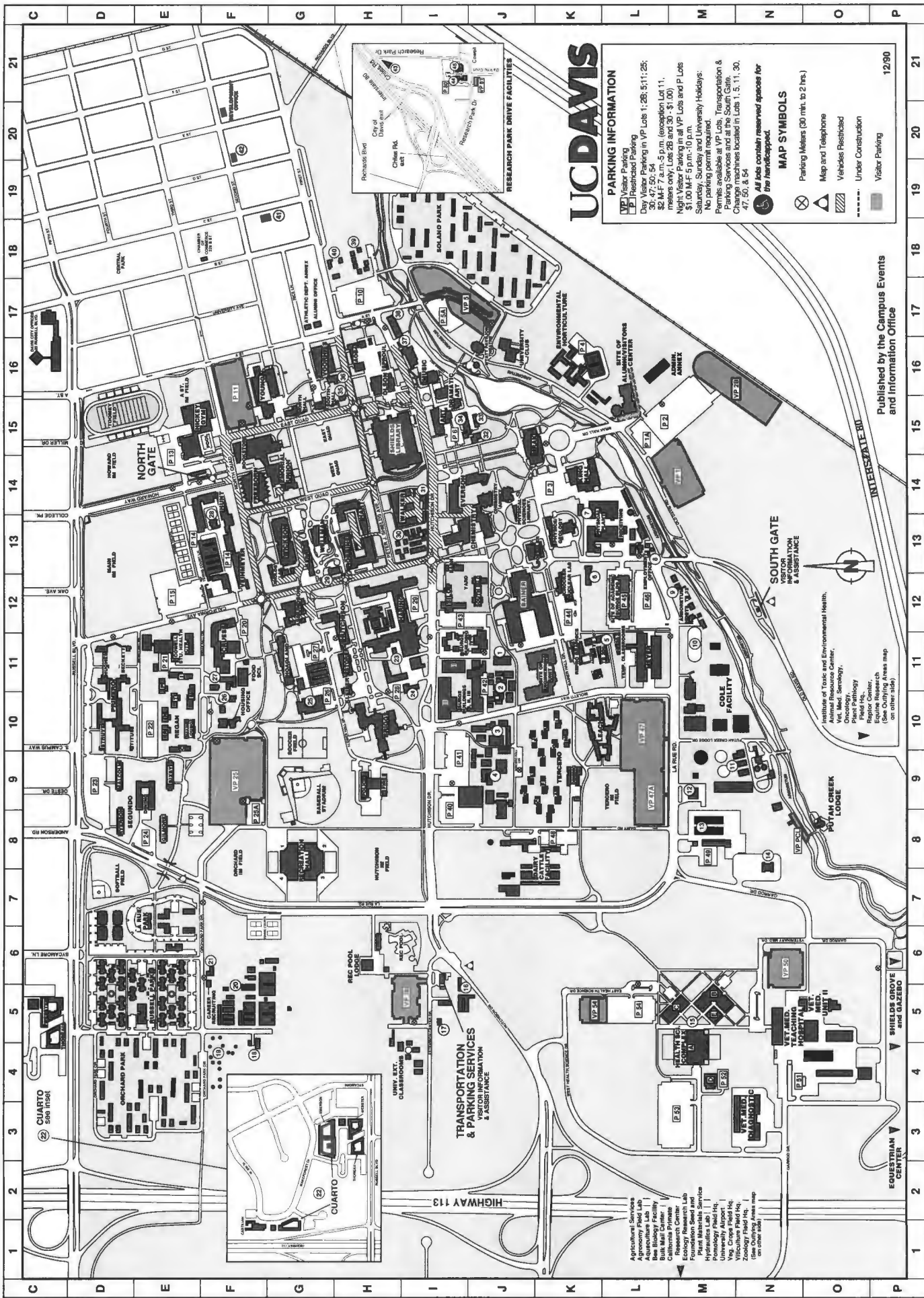
Work-Study, 34–35

X-Ray Crystallographic Facility, 19

Zoology, 394–397

FACILITIES, DEPARTMENTS, SERVICES
 (* Refer to Outlying Areas Map)

Admin Annex	L-16	Cashier's Office, Mrak	K-14	Environmental Horticulture	K-16	Intramural Programs, Rec Hall	G-7	Pomology, Wickson	G-13	Student Special Services, South Silo	J-12
Admissions, Mrak	K-14	Castilian	A-2	Environmental Studies, Div of, Wickson	G-13	Italian, French & Italian, Sproul	H-16	* Primate Center		Summer Sessions, Mrak	K-14
Advising Services, South Hall	G-15	Center for Admin of Criminal Justice, King	K-14	Environmental Toxicology, Meyer	L-11	Kerr Hall	G-13	Primero Housing	D-10	Surge Buildings I-III	I-10
Afro-American Studies, Kerr	G-13	Center for Cooperatives	H-16	Equestrian Center	P-3	King Hall (Law School)	K-14	Psychology, Young	G-16	Surge Building IV	I-11
Agricultural & Environmental Sciences, College of, Mrak	K-14	Center for Population Biology, Storer	H-11	* Equine Research Lab		Kleiber Hall	H-10	Pub, Silo	I-12	Teaching Resources Ctr, Wellman	H-13
45 Ag Comm Info & Publications Univ Svcs Bldg	I-21	Ceramics Lab, TB 9	I-17	45 Equipment Management, Univ Svcs Bldg	I-21	Labor Relations, Admin Annex	M-16	Public Research, Univ Svcs Bldg	I-21	40 Tecumseh Center, TB 113	I-13
Ag Econ, Voorhies	H-16	Chancellor's Office, Mrak	K-14	Experimental College, South Silo	J-12	LAW—Land, Air & Water Resources, Hoagland	G-11	45 Purchasing, Univ Svcs Bldg	I-21	4 Telecommunications	J-9
Ag Engineering, Bainer	J-12	Chancellor Emeritus Office, Meyer	L-11	Everson Hall	J-14	La Rue Park-Housing & Childcare	E-6	* Radiobiology Laboratory, IEHR		Temporary Buildings:	
16 Agricultural Field Station Bldg	F-4	Chemical Engineering, Bainer	K-12	Facility for Advanced Instrumentation, Hutchison	H-11	Law, School of, King	K-14	* Raptor Center		36 TB 9	I-17
Ag History Center, Voorhies	H-16	Chemistry	J-13	Financial Aid Office, North Hall	G-15	Learning Skills Center, South Hall	G-15	Receiving, Physical Plant	L-13	9 TB 29-34	M-12
* Ag Services		Chemistry Annex	J-14	Fire and Police Bldg	H-9	Letters & Science, College of, Mrak	K-14	Recreation Hall	G-7	30 TB 98-115	I-13
Agronomy & Range Science, Hunt	F-14	39 Chicano Studies, TB 101	I-13	First Resort	I-13	Libraries:		Rec Pool	I-6	39 TB 116-120, 123, 124	H-18
* Airport		2 Chinese-Japanese Program, TB 134	J-10	Food Science & Technology, Cruess	F-11	Shields	I-14	Rec Pool Lodge	H-6	8 TB 121-122	L-13
Alumni Office	G-17	43 Chiles Rd Facility	H-21	Food Science Bldg	F-11	Health Sciences	M-5	Regan Hall	E-10	2 TB134-158	J-10
American Studies, Sproul	H-16	Civil Engineering, Walker	I-13	4 H Coop Ext, Univ Svcs Bldg	I-21	Law, King	K-14	Registrar, Mrak	K-14	18 TB 140	F-4
Animal Physiology, Briggs	H-10	Classics, Spanish & Classics, Sproul	I-16	Freeborn Hall	G-14	Physical Sci	J-13	Relations with Schools, 2828 Chiles Rd	H-21	3 TB 161-172, 175, 191-194, 204, 205	J-10
* Animal Resources Service		Coffee House, MU	G-14	French & Italian, Sproul	I-16	Linguistics, Sproul	H-16	43 Religious Studies, Sproul	H-16	23 TB 173	I-11
Animal Science, Meyer	L-11	Comparative Literature, Sproul	H-16	Garage	M-8	Leach Hall	L-10	45 Repro Graphics & Annex	L-11	37 TB 195	I-16
Anthropology, Young	G-16	Computer Center, Hutchison	H-11	Genetics, Briggs	H-10	12 Mail Room	M-9	Univ Extd Bldg	I-21	5 TB 206, 207, O, N	L-11
AOB 4	H-16	Consumer Sciences, Everson	J-14	Geography, Kerr	G-13	Main Theatre (Dramatic Art)	I-15	45 Univ Svcs Bldg	I-21	Temp Classrooms 1-3	L-11
Applied Behavioral Sciences, AOB 4	H-16	Computer Sciences, Division of, Chem Annex	J-14	Geology, Physics/Geology, German and Russian, Sproul	H-16	Malcolm Hall	D-8	Repro Graphics & Annex	L-11	5 Temp Classrooms 1-3	L-11
Applied Science, Walker	I-13	34 Computing Support Services, Art Annex	J-15	Gilmore Hall	E-8	Management, Graduate School of: Admissions & Info, 129 C St.	G-18	Research Park Dr Facilities:		5 Textiles and Clothing, Everson	J-14
Aquaculture, Meyer	L-11	30 Conference Services, (Campus Events), MU	G-15	Gorman Museum, TB 111	I-13	Admin & Fac Offices, Voorhies	H-16	44 Univ Extd Bldg	I-21	Theatres: Arena & Main, Dramatic Art Wyatt Pavilion	I-15
* Aquaculture Lab		Coop Ext Hdqtrs	H-15	Graduate Studies, Mrak	K-14	Mann Laboratory	G-10	45 Univ Svcs Bldg	I-21	Thilla Hall, Tercero (A-F)	K-9
Arboretum Hdqtrs, TB 32	M-12	26 Cooperative Housing	F-10	Grad Student Assoc, South Silo	J-12	27 Marine Resources Lab	F-11	Robbins Annex	H-12	22 Thoreau Hall	C-4
1 Architects & Engineers	J-11	Counseling Ctr, North Hall	G-15	Greenhouse Area	F-5	45 Material Management, Univ Svcs Bldg	I-21	Robbins Hall	H-13	Titus Hall	D-10
Art	I-15	Cowell Student Health Center	E-11	Grounds Department	J-15	Mathematics, Kerr	G-13	Roessler Hall	K-13	Toomey Field	E-15
34 Art Annex	J-15	Craft Center, South Silo	J-12	33 Grounds Department	J-15	Mechanical Engineering, Bainer	K-12	Russell Park Apts	E-5	Tours, Info Services, Mrak	K-14
Art Galleries: Basement Gallery, Art	I-15	Crocker Nuclear Lab	K-12	Haring Annex	I-10	Medical Sci Complex (MSI, A-E)	M-5	* Russell Ranch		Transportation & Parking Services	I-6
Gorman	I-13	Cruess Hall	F-11	Haring Hall	I-12	15 Medicine, School of, Oean's Office	M-5	Russian, German & Russian, Sproul	H-16	UC Davis Presents, Freeborn	G-14
30 Memorial Union Nelson, Art	G-14	Cuarto Housing	C-3	Hart Hall	H-13	15c Medicine, School of, Oean's Office	M-5	Ryerson Hall	D-8	Unitrans Garage	N-8
32 Art Studio Facility	J-15	12 Custodial, Mail Room	M-9	Health Sciences Complex: A. Office & Labs B. Library & Bookstore C. Dean's Office D. Nuclear Magnetic Resonance E. Schalm Hall	M-5	Memorial Union (MU)	G-14	Schalm Hall	M-5	Univ Extension:	
Asian American Studies, AOB 4	H-16	Dairy Cattle Facility	K-8	Hickey Gymnasium	F-15	Meyer Hall	L-11	Seed Research Ctr (Parsons)	F-13	44 Info and Reg, Univ Extd Bldg Classrooms	I-21
Asmundson Hall	G-12	Development Office, 604 2nd St, Mansion Sq	F-20	History, Voorhies	H-16	Microbiology, Hutchison	H-11	Segundo Housing	E-8	14 University Club	J-16
Associated Students (ASUCD) MU	G-14	18 Division of Agricultural and Natural Resources	F-4	Hoagland Hall	G-11	Military Science, Hickey Gym	F-15	Shields Grove & Gazebo, Arboretum	P-6	36 University House	H-16
Athletic Dept Annex	G-17	Dramatic Art	I-15	Hog Barn	L-12	Molecular Cell and Dev Biology, Briggs Hall	H-10	Shields Library	I-14	University House Annex	H-16
31 Audio Visual Center, Walker Annex	I-13	Disability Resources Ctr, South Silo	J-12	Horse Arena	M-11	Mrak Hall	K-14	Silo Union	I-12	University House Annex	H-16
Avian Sciences, Meyer	L-11	40 Early Childhood Lab	H-18	Housing Office	F-10	Music Building	I-16	Snack Bars: Med Sci Memorial Union Silo	M-5	Vegetable Crops, Asmundson	G-12
19 Baggins End	F-4	East Asian Studies, Voorhies	H-16	Hughes Hall	D-11	Native American Studies, TB 113	I-13	Social Sci Data Service, AOB 4	H-16	Vet Med Diagnostic Lab	N-3
Bainier Hall	K-12	Economics, Kerr	G-13	42 Humanities Institute 508 2nd St.	F-20	Nematology, Hutchison	H-11	Sociology, Young	G-16	Vet Med Teaching Hospital	N-5
Bargain Barn, Physical Plant	L-13	Education, Kerr	G-13	39 Humanities Trailer	H-17	News Service, Mrak	K-14	Solano Park Apts	I-18	Vet Med Unit II	D-5
Barn, The	I-12	Educ Opportunity Prog Admissions, Mrak Counseling, North	K-14	Hunt Hall	F-14	North Gate Kiosk	F-14	South Gate Kiosk	N-12	Vet Med School of, Haring	I-12
Beckett Hall	D-11	Education Abroad Program, South Hall	G-15	Hutchison Hall	H-11	North Hall	G-15	South Hall	G-15	* Vet Med Serology Lab	
Bike Barn, The Barn	I-12	Educ Placement Service, South Hall	G-15	Illustration Services, Surge II	I-11	North Hall	G-15	South Silo	J-12	Vice Chancellors, Mrak	K-14
Biochemistry & Biophysics, Briggs	H-10	Electrical Engineering, Bainer	K-12	Information Services, Mrak	K-14	Nutrition, Meyer Hall	L-11	Spanish & Classics, Sproul	H-16	Visitor Information: Mrak Hall South Gate Parking	K-14
Biological Sciences, Division of, Mrak	K-14	Electron Microscope Lab, Hutchison	H-11	Institute for Toxicology and Environmental Health		Olson Hall	H-15	Sproul Hall	H-16	Veterans Affairs, South Silo	J-12
Biology of Large Animals, Cole	M-10	Emerson Hall	C-5	Institute of Ecology, Wickson	G-13	Orchard Park Apts	E-4	Staff Development:		Vet Med Diagnostic Lab	N-3
Bixby Hall	E-9	22 Employee Assistance Program	J-9	Institute of Governmental Affairs, Shields Lib	I-14	Outdoor Adventures, Barn	I-12	8 Office, TB 121	L-13	Vet Med Teaching Hospital	N-5
Bookstore, MU	G-14	4 Employment Office, TB 122	L-13	42 Institute of Theoretical Dynamics, 508 2nd St.	F-20	Parking Services	I-6	23 Classrm, TB 173	I-11	Vet Med Unit II	D-5
Bookstore Annex, South Silo	J-12	8 Employment Office, TB 122	L-13	Instructional Media, Olson	H-15	Parsons Seed Research Center	F-13	Staff Personnel, Admin Annex	M-16	Vet Med School of, Haring	I-12
Botany, Robbins	H-13	Engineering, College of, Bainer	K-12	Integrated Studies, Sproul	H-16	Personnel, Admin Annex	M-16	Statistics, Division of, Kerr	G-13	* Vet Med Serology Lab	
Box Office, Freeborn	G-14	English, TB 195	I-16	Intercollegiate Athletics: Hickey Gym Athletic Annex	F-15	Philosophy, Surge IV	J-11	Storehouse, Physical Plant	L-13	Vice Chancellors, Mrak	K-14
Briggs Hall	H-10	37 English A, TB 195	I-16	21 Internal Audit	F-6	Physical Education, Hickey Gym	F-15	Storer Hall	H-11	Visitor Information: Mrak Hall South Gate Parking	K-14
* California Primate Research Center		Enology, Viticulture & Enology, Wickson	G-13	International Relations, Voorhies	H-16	Physical Plant	L-13	Struve Hall	D-10	Veterans Affairs, South Silo	J-12
Campus Events and Information, MU	G-14	Enology Laboratory	G-13	International Student Svcs, South Hall	G-15	Physical Sci Library	J-13	Student Activities & Judicial Affairs, MU	G-14	Vet Med Diagnostic Lab	N-3
39 Campus Writing Center, TB 116	H-18	Entomology, Briggs	H-10	Internship & Career Center South Hall	G-15	Physics/Geology Bldg	K-13	Student Body Offices, (ASUCD) MU	G-14	Vet Med Teaching Hospital	N-5
Career Plan & Place Ctr, (see Internship & Career Ctr) South Hall	G-15	Environmental Design, Walker	I-13	Internship & Career Center South Hall	G-15	Pierce Hall, Tercero (G-L)	K-9	Student Employment Ctr, South Hall	G-15	Vet Med School of, Haring	I-12
Career Recruiting	F-5	9 Env Health & Safety, TB 29-31 & 34	M-12	Environmental Horticulture	K-16	Planning & Budget, Mrak	K-14	Student Farm Field House	I-5	* Vet Med Serology Lab	



UC DAVIS

PARKING INFORMATION

- VP** Visitor Parking
- R** Reserved Parking
- D** Day Visitor Parking in VP Lots 1, 2B, 5, 11, 25; 30, 47, 50, 54
- M** M-F 7 a.m. - 5 p.m. (excludes Lot 11, 25, 30, 47, 50, 54)
- N** Night Visitor Parking in all VP Lots and P Lots \$1.00 M-F 5 p.m. - 10 p.m.
- S** Saturday, Sunday and University Holidays: No parking permit required.
- P** Permits available at VP Lots, Transportation & Parking Services and at the South Gate.
- C** Change machines located in Lots 1, 5, 11, 30, 47, 50, & 54.

MAP SYMBOLS

- Parking Meters (30 min. to 2 hrs.)
- Map and Telephone
- Vehicles Restroom
- Under Construction
- Visitor Parking

All lots contain reserved spaces for the handicapped.



RESEARCH PARK DRIVE FACILITIES

TRANSPORTATION & PARKING SERVICES
VISITOR INFORMATION & ASSISTANCE

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12/90

Agricultural Services
Agronomy Lab
Bee Biology Facility
Bee Research Center
Bull Milk Center
Research Center
Ecology Research Lab
Genetics Lab
Hyperion Lab
Invertebrate Lab
Lentils Lab
Plant Materials Service
Plant Pathology Lab
Plant Physiology Lab
Plant Systematics
Soil Science
Veg. Crops Field Sq.
Viticulture Field Sq.
Wildlife Research Center
(See Outlying Areas map on other side)

Institute of Toxic and Environmental Health
Oncology
Plant Pathology
Regener Center
Equine Research
Equine Research Center
(See Outlying Areas map on other side)



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About the Cover

Thoreau Hall, completed in 1989, is UC Davis's newest residence hall. It's part of the Cuarto area, one block from the north boundary of the campus. Over a third of all resident living space is in the four halls located here. Designed in furnished suites and apartments, buildings are arranged in either a courtyard setting with open exterior walkways and interior courtyards or with swimming pools and spas. Thoreau Hall has 197 residential spaces arranged in eight-person suites. The three-story structure is designed so all rooms surround a central courtyard. Two dining commons, Castilian and Oxford Circle (color inset on the front cover) are in the area. The black and white cover photo, from about 1915, is of students in the East Hall dining room. This building, part dining hall, part infirmary, was located behind South Hall and was torn down in the 1970s.

Although at first glance the contrast between old and new residence hall rooms seems enormous, the 1915 South Hall room (opposite top) shows the same types of furniture, walls hung with pictures and posters, and a carpet on the floor. Even with uncurtained windows and hanging light fixtures, the comfort to students of that era was probably similar to that of the women in the middle picture. Not all students had the luxury of a room, however. The photo of the quad (bottom) shows tents erected for participants in an Agricultural Extension summer conference in the 1920s. South Hall, one of the original campus dormitories (now offices for student services), is shown in the background.



CREDITS:

Original design and gridwork/Connie Kearns and Robert Maddock

Current design and editorial/Arlene Snyder

Logo modification/Jan Conroy

Editorial and production coordination/Arlene Snyder and Keitha Hunter

Historical Photographs/Public Communications

Catalog produced on Macintosh IIfx and IIfx computers using QuarkXPress 3.0

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Davis, California 95616



Second Class