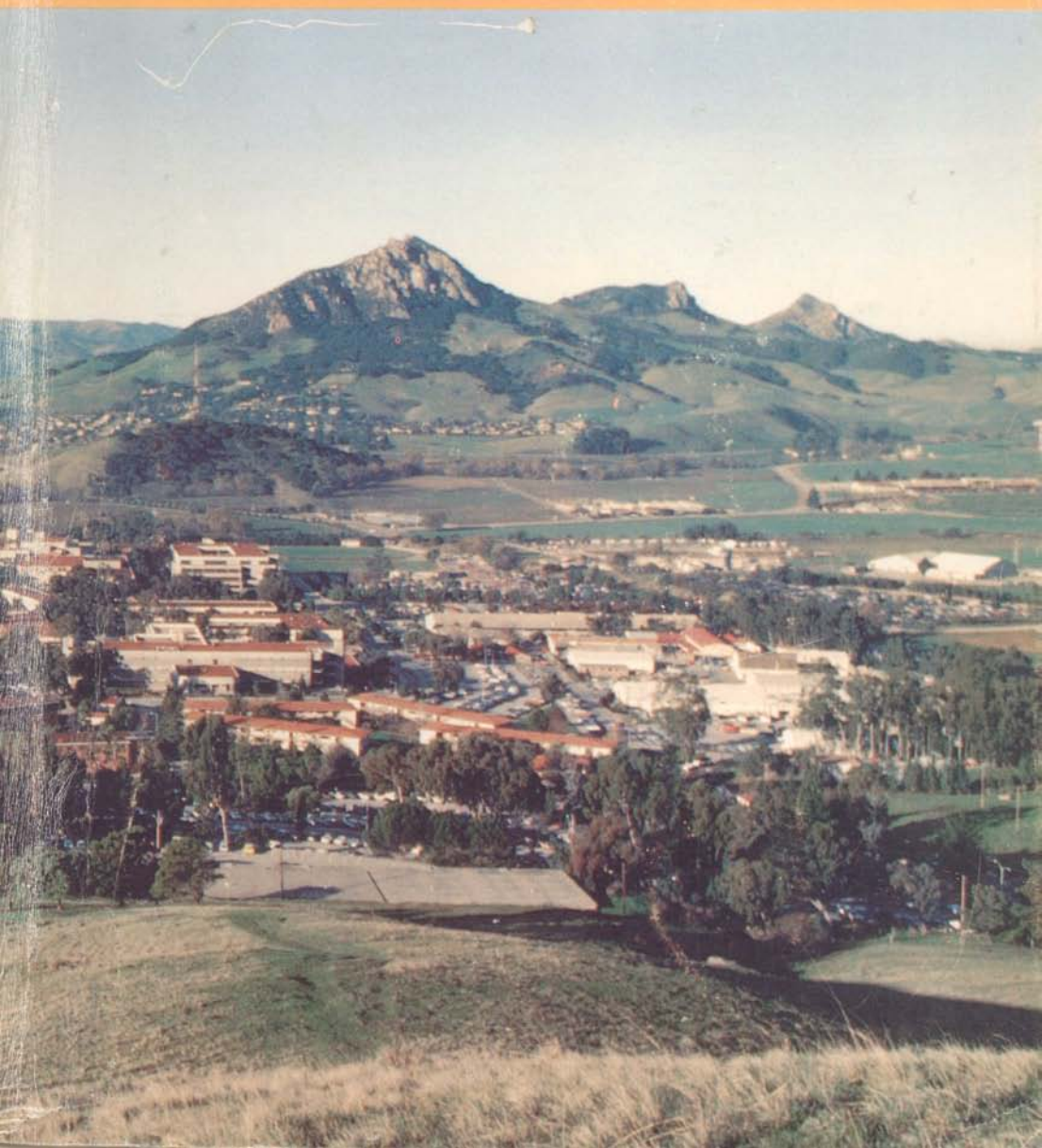


LEO HOGAN  
1984-86

# Cal Poly

1984-86  
Catalog



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*L.E. ROGERS  
ET/MS.*

California Polytechnic State University  
San Luis Obispo

CATALOG

1984-1986

ISSUE



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**CAMPUS MAP, Inside Back Cover**

# ACADEMIC CALENDAR—1984–1986

## Summer Quarter 1984

June 18	Monday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
June 22	Friday	Last day to register late and pay late registration fees
June 18–29	Monday–Friday	Regular add/drop period
June 29	Friday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms Last day to report a class being dropped without submitting a petition
July 4	Wednesday	Academic holiday—Independence Day
August 7	Tuesday	End of seventh week
August 24	Friday	Last day of classes
August 27–31	Monday–Friday	Final examination period
August 31	Friday	End of summer quarter
September 1–16	Saturday–Sunday	Academic holiday

## Fall Quarter 1984

September 17	Monday	Beginning of fall quarter (faculty only)
September 24	Monday	Fall quarter classes begin
September 28	Friday	Last day to register late and pay late registration fees
September 24– October 5	Monday–Friday	Regular add/drop period
October 5	Friday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms Last day to report a class being dropped without submitting a petition
November 12	Monday	Academic holiday—Veterans' Day
November 13	Tuesday	End of seventh week
November 21–25	Wednesday–Sunday	Academic holiday—Thanksgiving
December 7	Friday	Last day of classes
December 10–14	Monday–Friday	Final examination period
December 14	Friday	End of fall quarter
December 15– January 6	Saturday–Sunday	Academic holiday

## Winter Quarter 1985

January 7	Monday	Beginning of winter quarter Winter quarter classes begin
January 11	Friday	Last day to register late and pay late registration fees
January 7–18	Monday–Friday	Regular add/drop period
January 18	Friday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms Last day to report a class being dropped without submitting a petition
January 21	Monday	Academic holiday—Martin Luther King, Jr. Day
February 18	Monday	Academic holiday—Washington's Birthday
February 26	Tuesday	End of seventh week
March 15	Friday	Last day of classes
March 18–22	Monday–Friday	Final examination period
March 22	Friday	End of winter quarter
March 23–31	Saturday–Sunday	Academic holiday



## Spring Quarter 1985

April 1	Monday	Beginning of spring quarter
April 5	Friday	Spring quarter classes begin
April 1-12	Monday-Friday	Last day to register late and pay late registration fees
April 12	Friday	Regular add/drop period
		End of second week of instruction
		Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
May 20	Monday	End of seventh week
May 27	Monday	Academic holiday—Memorial Day
June 7	Friday	Last day of classes
June 10-14	Monday-Friday	Final examination period
June 15	Saturday	Commencement
		End of spring quarter
		End of university year (faculty only)
June 16-18	Sunday-Tuesday	Academic holiday

## Summer Quarter 1985

June 19	Wednesday	Beginning of university year
		Beginning of summer quarter
June 25	Tuesday	Summer quarter classes begin
		Last day to register late and pay late registration fees
June 19-July 2	Wednesday-Tuesday	Regular add/drop period
July 2	Tuesday	End of second week of instruction
		Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
July 4	Thursday	Academic holiday—Independence Day
August 7	Wednesday	End of seventh week
August 26	Monday	Last day of classes
August 27-30	Tuesday-Friday	Final examination period
August 30	Friday	End of summer quarter
August 31-September 15	Saturday-Sunday	Academic holiday

## Fall Quarter 1985

September 16	Monday	Beginning of fall quarter (faculty only)
September 23	Monday	Fall quarter classes begin
September 27	Friday	Last day to register late and pay late registration fees
September 23-October 4	Monday-Friday	Regular add/drop period
October 4	Friday	End of second week of instruction
		Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
November 11	Monday	Academic holiday—Veterans' Day
November 12	Tuesday	End of seventh week
November 27-December 1	Wednesday-Sunday	Academic holiday—Thanksgiving Day
December 6	Friday	Last day of classes
December 9-13	Monday-Friday	Final examination period
December 13	Friday	End of fall quarter
December 14-January 5	Saturday-Sunday	Academic holiday

## 6 Academic Calendar

### Winter Quarter 1986

January 6	Monday	Beginning of winter quarter Winter quarter classes begin
January 10	Friday	Last day to register late and pay late registration fees
January 6-17	Monday-Friday	Regular add/drop period
January 17	Friday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
January 20	Monday	Academic holiday—Martin Luther King, Jr. Day
February 17	Monday	Academic holiday—Washington's Birthday
February 25	Tuesday	End of seventh week
March 14	Friday	Last day of classes
March 17-21	Monday-Friday	Final examination period
March 21	Friday	End of winter quarter
March 22-30	Saturday-Sunday	Academic holiday

### Spring Quarter 1986

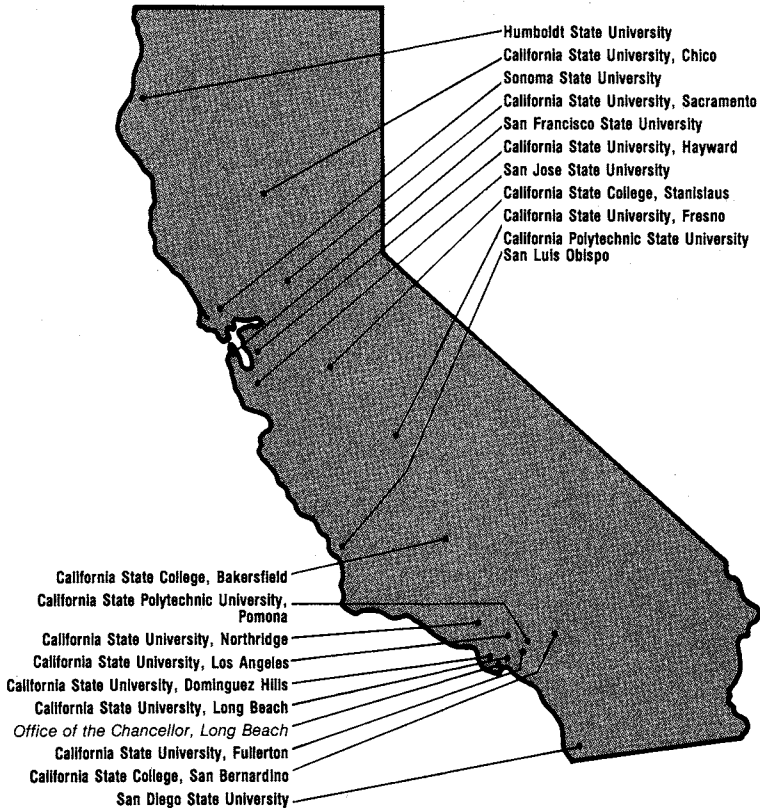
March 31	Monday	Beginning of spring quarter Spring quarter classes begin
April 4	Friday	Last day to register late and pay late registration fees
March 31- April 11	Monday-Friday	Regular add/drop period
April 11	Friday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
May 19	Monday	End of seventh week
May 26	Monday	Academic holiday—Memorial Day
June 6	Friday	Last day of classes
June 9-13	Monday-Friday	Final examination period
June 14	Saturday	Commencement
		End of spring quarter
		End of university year (faculty only)
June 15-17	Sunday-Tuesday	Academic holiday

### Summer Quarter 1986

June 18	Wednesday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
June 24	Tuesday	Last day to register late and pay late registration fees
June 17-30	Tuesday-Monday	Regular add/drop period
June 30	Monday	End of second week of instruction Last day for students to add a class and to submit add/drop (change of program) forms
		Last day to report a class being dropped without submitting a petition
July 4	Friday	Academic holiday—Independence Day
August 5	Tuesday	End of seventh week
August 22	Friday	Last day of classes
August 25-29	Monday-Friday	Final examination period
August 29	Friday	End of summer quarter



# THE CALIFORNIA STATE UNIVERSITY







## THE CALIFORNIA STATE UNIVERSITY

The individual California State Colleges were brought together as a system by the Donahoe Higher Education Act of 1960. In 1972 the system became The California State University and Colleges and in 1982 the system became The California State University. Today, 16 of the 19 campuses have the title "university."

The oldest campus—San Jose State University—was founded as a Normal School in 1857 and became the first institution of public higher education in California. The newest campus—California State College, Bakersfield—began instruction in 1970.

Responsibility for The California State University is vested in the Board of Trustees, whose members are appointed by the Governor. The Trustees appoint the Chancellor, who is the chief executive officer of the system, and the Presidents, who are the chief executive officers on the respective campuses.

The Trustees, the Chancellor, and the Presidents develop systemwide policy, with actual implementation at the campus level taking place through broadly based consultative procedures. The Academic Senate of The California State University, made up of elected representatives of the faculty from each campus, recommends academic policy to the Board of Trustees through the Chancellor.

Academic excellence has been achieved by The California State University through a distinguished faculty, whose primary responsibility is superior teaching. While each campus in the system has its own unique geographic and curricular character, all campuses, as multipurpose institutions, offer undergraduate and graduate instruction for professional and occupational goals as well as broad liberal education. All of the campuses require for graduation a basic program of "General Education—Breadth Requirements" regardless of the type of bachelor's degree or major field selected by the student.

The CSU offers more than 1,500 bachelor's and master's degree programs in some 200 subject areas. Nearly 500 of these programs are offered so that students can complete all upper-division and graduate requirements by part-time late afternoon and evening study. In addition, a variety of teaching and school service credential programs are available. A limited number of doctoral degrees are offered jointly with the University of California and with private institutions in California.

The Consortium of the CSU draws on the resources of the 19 campuses to offer regional and statewide off-campus degree, certificate, and credential programs to individuals who find it difficult or impossible to attend classes on a campus. In addition to Consortium programs, individual campuses also offer external degree programs.

Enrollments in fall 1983 totaled over 315,000 students, who were taught by a faculty of 18,500. Last year the system awarded over 50 percent of the bachelor's degrees and 30 percent of the master's degrees granted in California. More than 900,000 persons have been graduated from the 19 campuses since 1960.

# TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY

## EX OFFICIO TRUSTEES

The Honorable George Deukmejian .....	State Capitol, Sacramento 95814
Governor of California	
The Honorable Leo T. McCarthy.....	State Capitol, Sacramento 95814
Lieutenant Governor of California	
The Honorable Willie L. Brown, Jr. ....	State Capitol, Sacramento 95814
Speaker of the Assembly	
The Honorable Louis "Bill" Honig .....	721 Capitol Mall, Sacramento 95814
State Superintendent of Public Instruction	
Dr. W. Ann Reynolds .....	400 Golden Shore, Long Beach 90802
Chancellor of The California State University	

## APPOINTED TRUSTEES

Appointments are for a term of eight years, except for a student Trustee, alumni Trustee, and faculty Trustee whose terms are for two years. Terms expire in the year in parentheses. Names are listed in order of appointment to the Board.

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Mr. Willie J. Stennis (1991) .....	Golden Bird, Inc., 3947 Landmark, Culver City 90230
Mr. John F. O'Connell (1984) .....	21 Tamal Vista Blvd., Suite 109 Corte Madera 94925
Mr. Michael R. Peevey (1985) .....	Southern California Edison Co. P.O. Box 800, Rosemead 91770
Mr. John F. Crowley (1985) .....	San Francisco Labor Council, 1855 Folsom St., 5th Floor San Francisco 94103
Ms. Wallace Albertson (1986) .....	1618 Sunset Plaza Dr., Los Angeles 90069
Mr. Donald G. Livingston (1987) .....	Carter Hawley Hale Stores, Inc. 550 S. Flower St., 11th Floor, Los Angeles 90071
Ms. Celia I. Ballesteros (1987) .....	3636 Camino del Rio North, Suite 255 San Diego 92108
Ms. Lynne Wasserman (1988) .....	Levine & Leonard, 415 N. Camden Dr. Beverly Hills 90210
Dr. August F. Coppola (1988) .....	400 Golden Shore, Suite 322 Long Beach 90802-4275
Mr. George M. Marcus (1989) .....	Marcus & Millichap, Inc., 2626 Hanover St., Palo Alto 94304
Mr. Dixon R. Harwin (1990) .....	Alwin Management Co., Inc., 9300 Wilshire Blvd. Beverly Hills 90212
Mr. Thomas J. Bernard (1989) .....	Investors Bancor, P.O. Box 8210, Orange 92668
Mr. Roland E. Arnall (1990) .....	Chairman of the Board, Long Beach Savings and Loan 11878 La Grange, Los Angeles 90025
Mr. Daniel J. Bronfman (1984) .....	Associated Students Office, Sonoma State University Rohnert Park 94928
Mr. Roy T. Brophy (1991) .....	Gannon/Brophy Organization, 3040 Explorer Dr., Suite 11 Sacramento 95827
Dr. Robert D. Kully (1985) .....	Professor, Department of Communication Studies California State University, Los Angeles 5151 State University Dr., Los Angeles 90032
Dr. Dale B. Ride (1992) .....	Assistant to the Superintendent, Santa Monica Community College, 1900 Pico Blvd., Santa Monica 90405
Mr. Tom C. Stickel (1992) .....	T.C.S. Financial, Inc., 3878 Old Town Ave, Suite 202, San Diego 92110

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President

Mr. John F. O'Connell  
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Ms. Wallace Albertson  
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Chancellor W. Ann Reynolds  
Secretary-Treasurer

## OFFICE OF THE CHANCELLOR

The California State University  
400 Golden Shore  
Long Beach, California 90802-4275  
(213) 590-5506

Dr. W. Ann Reynolds .....	Chancellor
Dr. William E. Vandament.....	Provost and Vice Chancellor, Academic Affairs
Dr. Herbert L. Carter.....	Vice Chancellor, Administration
Mr. D. Dale Hanner.....	Vice Chancellor, Business Affairs
Dr. Caesar J. Naples.....	Vice Chancellor, Faculty and Staff Affairs
Mr. Mayer Chapman .....	Vice Chancellor and General Counsel

## THE CALIFORNIA STATE UNIVERSITY

California State College, Bakersfield .....	Dr. Thomas A. Arciniega, President
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California State University, Chico .....	Dr. Robin S. Wilson, President
1st and Normal Streets, Chico, California 95929	(916) 895-6116
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Carson, California 90747	(213) 516-3300
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Shaw and Cedar Avenues, Fresno, California 93740	(209) 294-4240
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1250 Bellflower Boulevard, Long Beach, California 90840	(213) 498-4111
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California State Polytechnic University, Pomona .....	Dr. Hugh O. La Bounty, President
3801 West Temple Avenue, Pomona, California 91768-4011	(714) 598-4592
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6000 J Street, Sacramento, California 95819	(916) 454-6011
California State College, San Bernardino .....	Dr. Anthony H. Evans, President
5500 State College Parkway, San Bernardino, California 92407	(714) 887-7201
San Diego State University .....	Dr. Thomas B. Day, President
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Imperial Valley Campus	
720 Heber Avenue, Calexico, California 92231	(619) 357-3721
San Francisco State University .....	Dr. Chia-Wei Woo, President
1600 Holloway Avenue, San Francisco, California 94132	(415) 469-2141
San Jose State University .....	Dr. Gail Fullerton, President
One Washington Square, San Jose, California 95192-0005	(408) 277-2000
California Polytechnic State University, San Luis Obispo .....	Dr. Warren J. Baker, President
San Luis Obispo, California 93407	(805) 546-0111
Sonoma State University.....	Dr. Hobert W. Burns, Interim President
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California State College, Stanislaus.....	Dr. A. Walter Olson, President
801 West Monte Vista Avenue, Turlock, California 95380	(209) 667-3122



## AVERAGE ANNUAL COST OF EDUCATION AND SOURCES OF FUNDS PER FULL-TIME EQUIVALENT STUDENT

The 19 campuses and the Chancellor's Office of The California State University are financed primarily through funding provided by the taxpayers of California. The total State appropriation to the CSU for 1983-84, including capital outlay, is \$929,650,300. The total cost of education for CSU, however, is \$1,199,787,540 which provides support for a projected 242,460 full-time equivalent (FTE) students.

The total cost of education in the CSU is defined as the expenditures for current operations, including payments made to the students in the form of financial aid, including all fully reimbursed programs contained in State appropriations, but excluding capital outlay appropriations. The average cost of education is determined by dividing the total cost by the total FTEs. The average cost is further differentiated into three categories: State Support (the State appropriation, excluding capital outlay), Student Fee Support, and Support from Other Sources (including Federal Funds).

Thus, excluding costs which relate to capital outlay (i.e., building amortization), the average cost of education per FTE student is \$4,948. Of this amount, the average student fee support per FTE is \$1,006. The calculation for this latter amount includes the amount paid by nonresident students.

### Source of Funds and Average Costs for 1983-84 CSU Budget (Projected Enrollment: 242,460 FTE)

	Amount	Average Cost Per Student (FTE) <sup>a</sup>	Percentage
Total Cost of Education .....	\$1,199,787,540 <sup>b</sup>	\$4,948	100.0
-State Appropriation .....	916,291,300 <sup>c</sup>	3,779	76.4
-Student Fee Support.....	243,896,427	1,006 <sup>d</sup>	20.3
-Support from Other Sources .....	39,599,813	163	3.3

<sup>a</sup> For budgetary purposes, full-time equivalent (FTE) translates total head count into total academic student load equivalent to 15 units per term. Some students enroll for more than 15 units; some students enroll for fewer than 15 units.

<sup>b</sup> The total cost of education does not include the amount related to the capital investment of the CSU. The estimated replacement cost of all the system's permanent facilities and equipment on the 19 campuses is currently valued at \$4.4 billion, excluding the cost of land.

<sup>c</sup> This figure does not include the capital outlay appropriation of \$13,359,000.

<sup>d</sup> The average costs paid by a student include the State University Fee, Student Services Fee, Application Fee, Catalog Fee, and Nonresident Tuition. Individual students may pay less than \$1,006 depending on whether they are part-time, full-time, resident or nonresident students.

## THE CONSORTIUM OF THE CALIFORNIA STATE UNIVERSITY

The Consortium of the CSU—"The 1000-Mile Campus"—is a separate, fully accredited, degree-granting entity of the CSU. It draws on the combined resources of the 19 campuses to offer external statewide and regional degree, certificate, and teaching credential programs.

The Consortium was established in 1973 to meet the needs of adults who find it difficult or impossible to participate in regular on-campus programs. Instruction is thus provided students in convenient places at convenient times. Currently, programs are offered in more than 20 geographic areas throughout California.

Full- and part-time CSU faculty, as well as qualified experienced practitioners, go where the students are, or provide opportunities for individualized home study. Programs can be tailored to meet the specific needs of employees in business, industry, education, or government.

Consortium programs are upper division or graduate level. All courses offer residence credit leading to bachelor's or master's degrees. Credit and course work are transferable statewide. Programs are financed by student fees.

Academic policy for The Consortium is established by the statewide Academic Senate of the CSU. Degrees or certificates are awarded by The Consortium in the name of the Board of Trustees of the CSU. The Consortium is accredited by the Western Association of Schools and Colleges.

For more information contact: The Consortium of The California State University, 400 Golden Shore, Long Beach, California 90802; (213) 590-5696.

The statewide Admissions and Records Office may be reached by dialing the following local numbers: Los Angeles and Long Beach areas (213) 498-4119; all other areas in California toll free (800) 352-7517.

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## EDUCATION AT CAL POLY

Cal Poly is different. The difference is apparent to visitors who see the large, diversified campus with its well-tended farmlands stretching away from the academic core. But the difference goes beyond its size, appearance, and unique setting.

Throughout its history, Cal Poly has emphasized career-oriented education. Its dedication and success have created for the University a distinctive role in higher education. Its statewide and national reputation has made it one of the most popular campuses in California.

The California Legislature authorized Cal Poly's special goals. The administration and faculty are dedicated to achieving those goals, and students are attracted to Cal Poly because they want to benefit from the special educational opportunities the University offers. Those opportunities have led to significant, meaningful jobs for thousands of graduates.

Cal Poly's distinctive character is reflected in its majors: Of the 55 undergraduate majors offered, 13 are available within The California State University system only at Cal Poly, and another 11 are offered at only one other CSU campus. The University's practical emphasis is reflected in its programs in such applied fields as agriculture, architecture, business, engineering, home economics and the necessary closely related supporting fields of physical sciences, natural sciences, and mathematics. It is also reflected in the fact that each applicant is required to select an academic major at the time of application, whether seeking to enter directly from high school or to transfer from another college.

At Cal Poly a constant interplay is attempted between general principles and practical applications, whether in the laboratory, the classroom, or field study. Departments assist students in obtaining actual experience through individual and group projects, work-study programs, cooperative education (a program offering students periods of paid, full-time work in business and industry), and internships. Such practical educational experiences in the major field prepare the student for specific occupations and professions or for advanced study.

In keeping with Cal Poly's philosophy, faculty members are encouraged to give effective teaching the highest priority. They are selected on the basis of professional experience and teaching ability as well as academic qualifications.

Yet even as it believes in the importance of a practical education, the University firmly believes that such useful, realistic knowledge must be put into the hands of men and women who possess the maturity, awareness, and wisdom to use it well. So career-oriented education is taught within the frame work of a thorough general education that includes a variety of courses outside the major. Cal Poly's applied disciplines are complemented by programs in science, mathematics, education, the humanities, and the social sciences.

Cal Poly is also dedicated to helping each individual achieve maximum personal development. An extensive cocurricular program helps the student to develop citizenship, leadership, and the skills necessary for constructive and productive life in the community. Student and faculty participation in the development and improvement of both curricular and cocurricular programs characterizes Cal Poly's mode of learning.

## HISTORICAL DEVELOPMENT

Cal Poly began in 1901 when the Legislature established a vocational high school at San Luis Obispo. From its inception, the institution has been a leader in vocational education for agriculture and industry in California.

In 1921 the school's Board of Trustees was dissolved, and the State Board of Education began administering the school. It did so until July 1, 1961, when administration passed to the Trustees of The California State University and Colleges (now The California State University).

Cal Poly began offering junior college courses in 1927, and became a two- and three-year institution in 1933. In 1936 a degree transfer program was added, and in 1940 the first Bachelor of Science degrees were authorized.

The first baccalaureate exercises were held in 1942. Approval to grant the Master of Arts degree in education was received in 1949, and to grant the Master of Science degree in 1967.



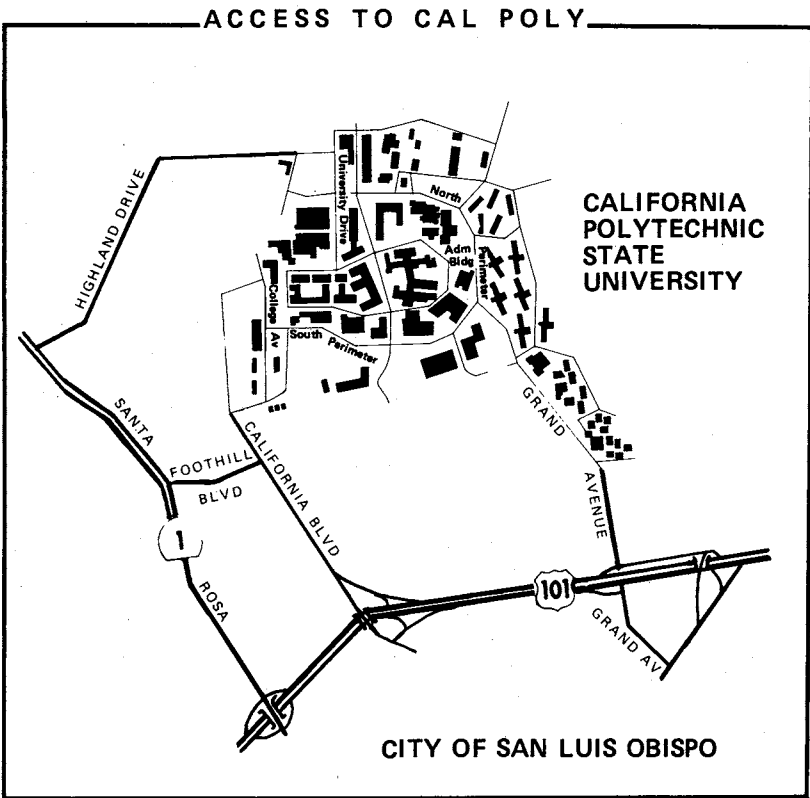
Cal Poly has been guided by the following chief executive officers:

Leroy Anderson.....	1902 to 1908
Leroy Burns Smith.....	1908 to 1914
Robert W. Ryder.....	1914 to 1921
Nicholas Ricciardi.....	1921 to 1924
Margaret Chase (acting) .....	1924
Benjamin Ray Crandall .....	1924 to 1933
Julian A. McPhee .....	1933 to 1966
Dale W. Andrews (acting) .....	1966 to 1967
Robert E. Kennedy.....	1967 to 1979
Dale W. Andrews (acting) .....	1979
Warren J. Baker.....	1979 to present

Under their leadership, Cal Poly has developed into one of the nation's outstanding career-oriented universities.

THE CAMPUS

The Cal Poly campus consists of more than 5,000 acres adjacent to San Luis Obispo, a community of 35,700 on U.S. Highway 101, midway between San Francisco and Los Angeles, and 12 miles from the beaches and marine facilities of California's Central Coast.



Because of the nature of Cal Poly's curricula, instructional facilities are diverse and designed to encourage a close student-faculty relationship. In addition to faculty offices, classrooms, and laboratories for instructional use, the campus is served by several specialized facilities, particularly in agriculture, architecture, engineering, and the sciences. Support facilities include an on-campus residence hall complex for more than 2,800 students, a variety of dining facilities serving students living both on campus and off, extensive physical education facilities, an on-campus health center, and a university union complex.

Cal Poly has long been known as a friendly campus that welcomes visitors. Visitor parking permits and campus maps are available from the information desk in the Administration Building. The Relations with Schools Office offers regular, scheduled campus tours, open to anyone. Information about days and times can be obtained from the campus operator (805-546-0111) or the Relations with Schools Office (805-546-2792). Arrangements for group tours of the campus may be made through the Relations with Schools Office.

## ACCREDITATION

The University is fully approved as a four-year degree-granting institution by the Western Association of Schools and Colleges.

The School of Architecture and Environmental Design has four accredited programs: Architectural Engineering by the Accrediting Board for Engineering and Technology; Architecture (bachelor's and master's degrees) by the National Architectural Accrediting Board; Construction Management by the American Council for Construction Education; and Landscape Architecture by the American Society of Landscape Architects. In addition, City and Regional Planning is recognized by the American Planning Association.

The School of Engineering and Technology has 14 accredited programs: Aeronautical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Air Conditioning and Refrigeration Technology, Electronic Technology, Manufacturing Processes Technology, Mechanical Technology, and Welding Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology. Industrial Technology is accredited by the National Association of Industrial Technology.

Other accredited programs are Agricultural Engineering accredited by the Accrediting Board for Engineering and Technology, Business Administration (bachelor's degree) by the American Assembly of Collegiate Schools of Business, Chemistry by the American Chemical Society, and Home Economics by the Council for Professional Development of the American Home Economics Association. The Dietetics program is approved by the American Dietetics Association.

In addition the Commission for Teacher Credentialing has authorized the University to recommend for a number of teaching credentials, described in the catalog section on "Teacher Preparation Programs."

## PROFESSIONAL DEVELOPMENT AND RESEARCH

Cal Poly seeks to instill in its students intellectual maturity, an appreciation of learning and a dynamic professionalism. To foster such attitudes among students, the University places great emphasis on faculty professional development. It strives to stimulate faculty members to challenge themselves—to develop professionally through membership in organizations, creative activities, consulting, professional experience in business and industry, and applied or basic research.

Outside sources of funding to promote faculty professional development activities and research are actively sought through the Research Development Office. Students often participate in research and development through classroom and laboratory exercises, in senior projects and master's theses, and by working as student assistants on sponsored projects.

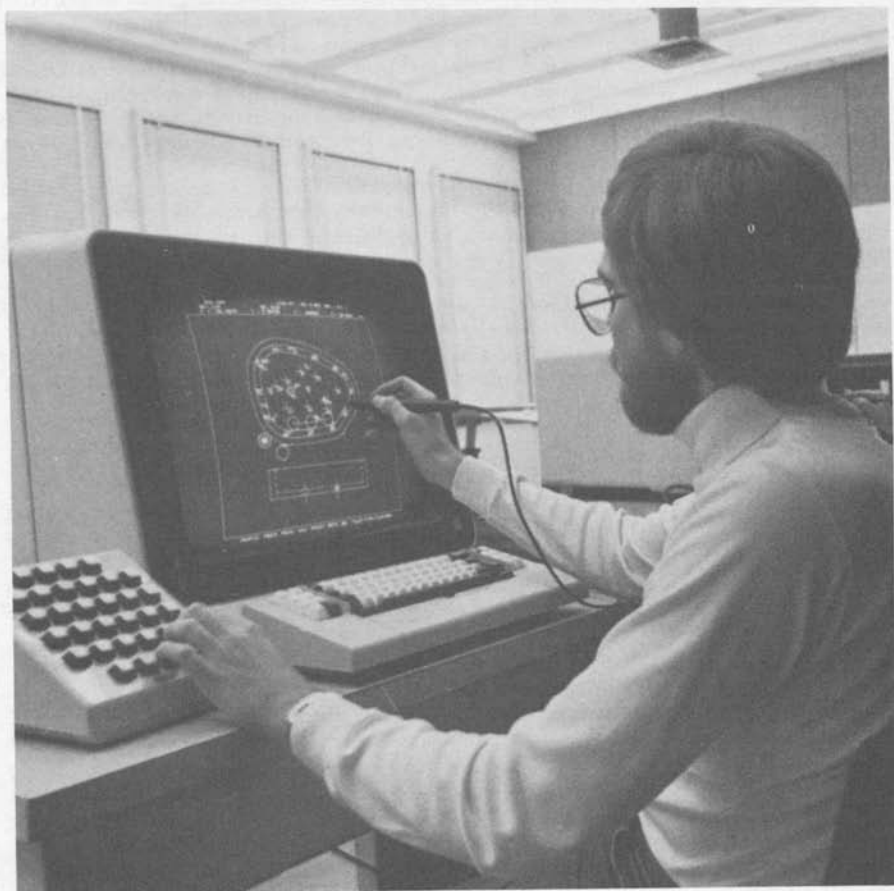
## COMPUTER-AIDED PRODUCTIVITY CENTER

The Computer-Aided Productivity Center has been established to provide campus, state and national leadership in Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) education and research. Operating primarily to serve the educational needs of the University, the Center reports directly to the Office of the Associate Provost for Information Systems.

The Computer-Aided Productivity Center is currently responsible for implementing over \$4,000,000 in industry grants. This includes an eight-station CADAM system, expanding to twenty multicampus stations in 1985 with the addition of a major IBM grant. Recent donations of a Data General MV/10000-based CAD system and a DEC PDP 11/44-based CAM system have also been fostered by the Center.

The Computer-Aided Productivity Center is one of the most active CAD/CAM organizations in any university in the nation. In its first 18 months of operation, the Center provided the opportunity for substantial state-of-the-art CAD/CAM experience to over 65 faculty and 1000 students.

In addition to education for improved design techniques, the Computer-Aided Productivity Center is actively capitalizing on major University strengths in CAM. During 1985, the Center will be connecting the design data base directly to Cal Poly's computer-controlled machine tools. The result will be an ability to educate students in the completely paperless design and manufacturing methodologies of tomorrow.



## ROBERT E. KENNEDY LIBRARY

The Robert E. Kennedy Library provides a variety of comfortable and attractive environments for study, research, and browsing. The building features an interior courtyard design, open stack accessibility, and individual study stations. The Library collection contains over two million bibliographic items. The 700,000-volume book collection is supplemented by periodicals, art prints, nearly 1,300,000 microforms, senior projects, government documents, and maps.

One of the major activities of the Library is library instruction. Besides individual instruction in the use of the library, librarians conduct library tours for groups and individuals and also give lectures to class groups at the request of instructors. The Library offers two credit-bearing courses in the use of library materials to students during Fall, Winter, and Spring quarters.

The Reference Department contains extensive holdings of reference materials, indexes, and abstracts. Also included in the reference collections are telephone directories for all metropolitan areas and state capitals within the United States, industrial standards from the major professional and trade associations, manufacturers' catalogs from over 16,000 companies, college catalogs from all fifty states, annual reports from all corporations listed on the American and New York Exchanges, and computer manuals. In addition to regular reference service, on-line computer search services are available for student and researcher needs.

The Learning Resources and Curriculum Department provides students with the textbook collection, the curriculum materials collection, the children's book collection, the standardized text collection, and audiovisual materials including video cassettes, audio cassettes, color slides, sound filmstrips, film loops, multi-media kits, study prints and fine art prints.

The Government Documents and Maps Department is a selective depository for United States documents and California State documents. It also contains the local government collection, Agricultural Experiment Station and Extension Service publications, National Technical Information Services (NTIS) and United Nations documents, and is the Diablo Canyon Nuclear Power Plant Document Depository.

The Special Collections and University Archives Department contains many specialized research collections which because of their value or rarity must have added protection. The Julia Morgan (Hearst Castle architect) collection, the Fairs (world, state, and local) collection, and the Arthur G. Barton (architect of Dodger Stadium) collection are a few examples of the materials the Library has obtained in recent years.

The University Archives houses records and other materials which document the history, development, and activities of the University from its beginning in 1903 to the present day.

Materials which are not available in the Library's collections can be requested from Interlibrary Loan and supplied from one of the nineteen CSU libraries, the University of California library system, or from other cooperating libraries throughout the United States.

## THE FOUNDATION

The California Polytechnic State University Foundation is a separate nonprofit corporation created to support and assist the educational mission of the university. The major objectives of the Foundation are:

- To provide the fiscal means and management procedures that enable the university to carry on activities providing those instructional and service aids not normally furnished by the state.

- To provide effective operation of key support services which would not otherwise be available due to legal, purchasing, and other fiscal restrictions.

- To provide fiscal procedures and management systems that foster effective coordination of the auxiliary activities with the university in accordance with sound business practices.

Important services provided to the university community include El Corral Bookstore, Communications/Media Productions, and campus Food Services. In addition, the Foundation provides the basic financial, management, and business support services for University Graphics System; sponsored research, grant, and workshop projects; and serves as a trustee for gifts designated for the university and its various educational programs.

The California Polytechnic State University Foundation aids students financially by sponsoring student enterprise projects and by employing students. By loaning operating capital for faculty-supervised and educationally significant projects, the Foundation aids students by helping them to combine learning and earning.

A Board of Directors oversees the operation of the Foundation which is administered by a management staff. Activities in which the Foundation is engaged must be requested and approved by the university, and each year the operations are subject to independent financial and compliance audits.

The Foundation Board holds monthly meetings which are open to the public and are regularly attended by representatives of the university's faculty, staff, and student government.

## CAL POLY ALUMNI ASSOCIATION

Cal Poly's Alumni Association is an important communications link between the University and the more than 130,000 students who have attended California Polytechnic State University, San Luis Obispo, since 1901.

To maintain these ties with former students, the Association coordinates a variety of alumni gatherings, both educational and social, throughout California, the United States and the world.

Approximately 15,000 annual and life members of the Association are offered opportunities to participate in group travel, insurance plans and other special Association-sponsored programs such as off-campus seminars and alumni activities at Homecoming and Poly Royal. The Association also assists in the production of the quarterly university alumni publication, *Cal Poly Today*, and cosponsors several special events for students on campus.

Through annual contributions, the Association provides loans and scholarships for students and has recently established an undergraduate alumni chapter through which students may participate in alumni-related activities.

The Association is headed by an international president and two vice presidents, a secretary-treasurer, 17 directors representing different sections of the State, and a campus Alumni Services coordinator. In addition, the Association has established 13 local alumni chapters in California which are involved in varied activities ranging from luncheons to pre- and post-athletic game receptions.

Cal Poly Alumni Association memberships for alumni, students, faculty, staff and friends are available through the Alumni Services office located in Alumni House.

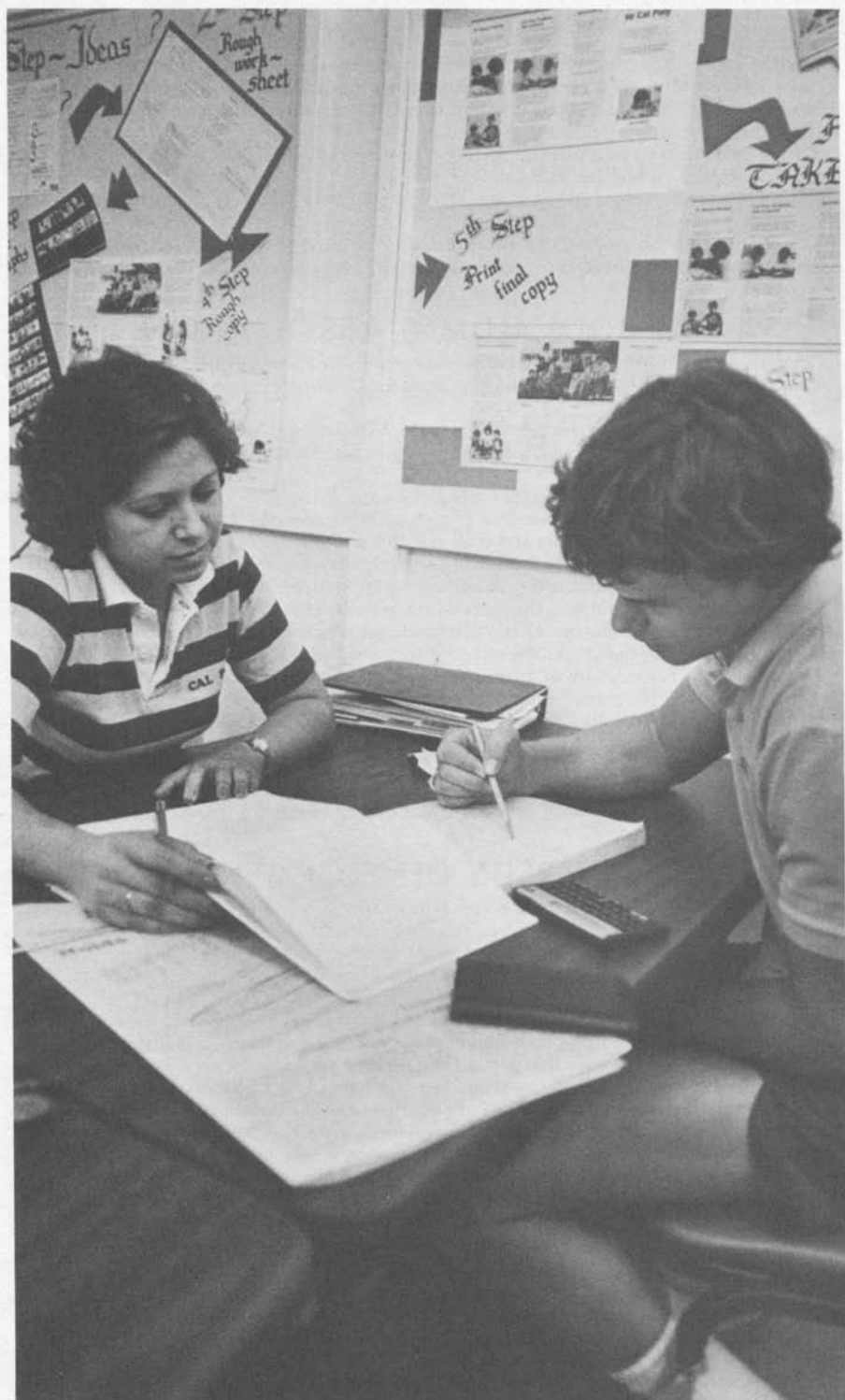
## UNIVERSITY DEVELOPMENT

Gifts from many friends help the University maintain the excellence of its programs. These friends include alumni, parents of students, other individuals, corporations, businesses, and foundations. Their contributions are of significant assistance. They enhance ongoing programs and provide funds for major capital improvements that cannot be financed through State resources.

Contributions made through estate planning and deferred giving have been especially beneficial, both to the University and to the donors. They permit donors to make major gifts whose benefits to the University continue beyond the lifetime of the donor.

Several advisory groups provide valuable help in meeting University needs. The President's Cabinet and the President's Round Table are selected from the various constituencies that the University serves, and are active in developing financial support from individuals and corporations. Advisory councils of the various schools of the University provide additional assistance.

Cal Poly's Alumni Association also cooperates closely in the development program.



# Admissions and Registration

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## ADMISSIONS PROCEDURES AND POLICIES

Requirements for admission to California Polytechnic State University, San Luis Obispo are in accordance with Title 5, Chapter 1, Subchapter 3, of the *California Administrative Code*. If you are not sure of these requirements you should consult a high school or community college counselor or the admissions office. Applications may be obtained from the admissions office at any of the campuses of The California State University or at any California high school or community college.

### Importance of Filing Complete, Accurate, and Authentic Application for Admission Documents

The CSU advises prospective students that they must supply complete and accurate information on the application for admission, residence questionnaire, and financial aid forms. Further, applicants must submit authentic and official transcripts of all previous academic work attempted. Failure to file complete, accurate, and authentic application documents may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301, Article 1.1, Title 5, *California Administrative Code*).

### UNDERGRADUATE APPLICATION PROCEDURES

Prospective students, applying for part-time or full-time programs of study, in day or evening classes, must file a complete application as described in the application booklet. The \$35 nonrefundable application fee should be in the form of a check or money order payable to The California State University and may not be transferred or used to apply to another term. Applicants need file only at their first choice campus. An alternative choice campus and major may be indicated on the application, but *applicants should list as an alternative campus only that campus of The California State University that they can attend*. Generally, an alternative degree major will be considered at the first choice campus before an application is redirected to an alternative choice campus. Applicants will be considered automatically at the alternative choice campus if the first choice campus cannot accommodate them.

### IMPACTED PROGRAMS

Impacted programs are undergraduate programs in which the number of applications received in the first month of the filing period exceeds the total spaces available, either locally (at individual campuses) or systemwide. You must make application for an impacted program during the first month of the filing period and may file more than one application and fee for additional programs. Nonresidents, foreign and domestic, are advised that there is little likelihood of being admitted to impacted programs. High school and community college counselors are informed before the opening of the fall filing period which programs will be impacted.

### Supplementary Admission Criteria

Each campus with impacted programs uses supplementary admission criteria in screening applicants. Campuses are authorized to use a freshman applicant's ranking on the eligibility index, the transfer applicant's overall GPA (grade point average), or a combination of campus-developed supplementary criteria in selecting those to be admitted. If you are a freshman applicant and plan to apply to an impacted program, you should take the ACT or SAT test at the earliest date. Your test scores and your grades earned in the final three years of high school may be used in determining admission to the program. The supplementary admission criteria used by the individual campuses to screen applicants appear periodically in the *CSU School and College Review* and are sent by the campuses to all applicants seeking admission to an impacted program.

Unlike unaccommodated applicants to locally impacted programs, who may be redirected to another campus in the same major, unaccommodated applicants to systemwide impacted programs may not be redirected in the same major but may choose an alternative major either at the first choice campus or another campus.



## POSTBACCALAUREATE APPLICATION PROCEDURES

All applicants for any type of postbaccalaureate status (e.g., master's degree applicants, those seeking credentials, and those interested in taking courses for personal or professional growth) must file a complete application within the appropriate filing period. A complete application for postbaccalaureate status includes all of the materials required for undergraduate applicants (part A) plus the supplementary graduate admissions application (part B). Postbaccalaureate applicants who completed undergraduate degree requirements and graduated the preceding quarter also are required to complete and submit an application and the \$35 nonrefundable application fee. Since applicants for postbaccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternative campuses or later changes of campus choice will be minimal. In the event that a postbaccalaureate applicant wishes to be assured of initial consideration by more than one campus, it will be necessary to submit separate applications (including fees) to each. Applications may be obtained from the Graduate Studies Office of any California State University campus in addition to the sources noted for undergraduate applicants.

### APPLICATION FILING PERIODS

Quarter	Applications First Accepted	Filing Period Duration	Student Notification Begins
Summer	Previous Feb. 1	Each campus accepts applications until capacities are reached. Most campuses accept applications up to a month prior to the opening day of the term. Some campuses will close individual programs as they reach capacity.	Previous March
Fall	Previous Nov. 1		Previous Dec.
Winter	Previous June 1		Previous July
Spring	Previous Aug. 1		Previous Sept.

### Space Reservation Notices

Normally, you may expect to receive some form of space reservation notice from your first choice campus within two months of filing the application. A notice that space has been reserved is also a request for records necessary to make the final admission decision. It is an assurance of admission *only* if evaluation of your previous academic record indicates that admission requirements have been met. Such a notice is not transferable to another term or to another campus.

### HARDSHIP PETITIONS

There are established procedures for consideration of qualified applicants who would be faced with extreme hardship if not admitted. Prospective hardship petitioners should write the Admissions Office regarding specific policies governing hardship admission.

## UNDERGRADUATE ADMISSION REQUIREMENTS

### First-Time Freshman Applicants

First-time freshman eligibility is determined by (1) high school grade point average, (2) scores on either the ACT or SAT tests, (3) whether the applicant is a resident of California, and (4) whether four years of college preparatory English and two years of college preparatory mathematics have been completed.

## 26 Admissions Procedures and Policies

### Test Requirements

Applicants with fewer than 56 semester or 84 quarter units of transferable college work must submit scores for either the Scholastic Aptitude Test of the College Board (SAT) or the American College Testing Program (ACT). Registration forms and test dates for either test may be obtained from school or college counselors or from a campus Testing Office. Or, you may write to the following addresses:

#### ACT Address

American College Testing Program  
Registration Unit, P.O. Box 168  
Iowa City, Iowa 52240

#### SAT Address

The College Board  
Registration Unit, P.O. Box 592  
Princeton, New Jersey 08541

### Grade Point Average and Test Score Requirement

To determine eligibility, the campus needs (1) the high school grade point average (for the final three years of high school, not counting physical education or military science) and (2) either the total score from the Scholastic Aptitude Test or the composite score from the American College Test. These are used to compute an eligibility index. Applicants can calculate their index by multiplying their grade point average by 800 and adding their SAT total score. Or, if they took the ACT, multiply their grade point average by 200 and add 10 times their ACT composite score. At Cal Poly, San Luis Obispo test scores are required of *all applicants*.

#### Excerpts from Admissions Table for California High School Graduates

GPA.....	2.00 *	2.20	2.40	2.60	2.80	3.00	3.20 **
ACT Score .....	35	31	27	23	19	15	11
SAT Score .....	1472	1312	1152	992	832	672	512

\* Below 2.0 not eligible.

\*\* Above 3.20 exempt from test requirement.

### First-Time Freshman Applicants (California High School Graduates and Residents)

Applicants who are graduates of a California high school or legal residents for tuition purposes need a minimum eligibility index of 741 (ACT) or 3072 (SAT). The above table illustrates grade point averages and scores needed to qualify for admission.

### First-Time Freshman Applicants (Nonresident)

Applicants who are neither residents for tuition purposes nor graduates of a California high school need a minimum eligibility index of 826 (ACT) or 3402 (SAT).

### College Preparatory English Requirement

Beginning with admission to the fall term 1984 and thereafter, all entering freshmen must have completed four years of high school college preparatory English with grades of C or better. If a high school did not offer a fourth year of college preparatory English or the English courses completed were not college preparatory, CSU campuses may waive a portion of the requirement during the 1984-86 phase-in period.

Regular 9th and 10th grade English courses are usually college preparatory. Most English courses for 11th and 12th graders are considered college preparatory if they include substantial instruction in reading and writing and frequent writing assignments. Written work should require critical thinking and the presenting of ideas in clear, sharp, and persuasive written form. Regular writing assignments, critically graded and rewritten, are the best preparation for college work. College preparatory English courses also should require wide reading in both modern and classical literature, fiction and nonfiction. There should be a close relationship between reading and written work.

Courses in speech, drama, or journalism are acceptable if they include the kinds of reading and writing experiences described. Courses in remedial reading and writing are not college preparatory. Beginning or intermediate courses in English as a Second Language (ESL) are not considered college preparatory although a year of advanced level ESL is acceptable as one year of the four-year English requirement. If there are questions about which courses are college preparatory, a high school counselor or other staff can advise you.

### College Preparatory Mathematics Requirement

Beginning with admission to the fall term 1984 and thereafter, all entering freshmen must have completed two years of high school college preparatory mathematics with grades of C or better. Most students will take algebra and geometry; second year algebra is strongly recommended. If the applicant plans to complete a college major in mathematics, science, engineering, computer science, pre-medicine, or other science-related fields, business, or economics, the applicant should take four years of college preparatory mathematics. Business or technical mathematics, arithmetic, pre-algebra, and similar basic classes are not college preparatory.

### Additional College Preparatory Courses Recommended

English and mathematics are not the only high school courses needed to prepare for college. There are many college courses where the instructor will expect students to have had high school preparation in biology, physics, chemistry, history, economics, geography, as well as art and music. There are some college majors that require high school preparation in a foreign language.

Students should take full advantage of the college preparatory courses offered in high school, continuing studies, particularly in English and mathematics, through the entire senior year. A solid college preparatory program will be valuable no matter where the applicant goes to college and will prepare him or her to compete on an equal basis with other students.

### TOEFL Required of Applicants Who Attend Foreign Institutions

Beginning with admission to the fall term 1984 and thereafter, all undergraduate applicants, regardless of citizenship, who have not attended for at least three years schools at the secondary level or beyond where English is the principal language of instruction are required to earn a minimum score of 550 on the Test of English as a Foreign Language (TOEFL).

## UNDERGRADUATE TRANSFER ADMISSION REQUIREMENTS (Resident and Nonresident)

### Grade Point Average and Subject Requirements

If in good standing at the last college or university attended, applicants can qualify for admission by meeting one of the following standards:

1. They graduated from high school prior to spring 1984, and
  - a. *were eligible as a freshman* and have a grade point average of "C" (2.0 on a scale where A = 4.0) or better in all transferable college units attempted, *or*
  - b. *were not eligible as a freshman* and have completed at least 56 transferable semester units or 84 transferable quarter units, with a grade point average of "C" or better if they are California residents for tuition purposes (2.4 if a nonresident).
2. They graduated from high school in the spring of 1984 or later, and
  - a. *were eligible as a freshman* (see freshman requirements) and have a grade point average of "C" or better in all transferable college units attempted, *or*
  - b. *were eligible as a freshman except* for the high school subject requirements in English and mathematics, have satisfied any deficiencies by equivalent course work, and have a grade point average of "C" or better in all transferable college units attempted, *or*
  - c. *were not eligible as a freshman*, have completed at least 56 transferable semester units or 84 transferable quarter units, with a grade point average of "C" or better if they are California residents for tuition purposes (2.4 if a nonresident), and have satisfied any high school subject deficiencies in English and mathematics by equivalent course work.

Transferable courses are those designated for that purpose by the college where the courses are taken.

### INTERNATIONAL (FOREIGN) STUDENTS

To be considered for admission from a foreign country, an applicant must meet separate requirements in addition to those listed for American students at the same class level. These requirements are:

1. Two official English translations of transcripts covering all high school and college work attempted.
2. An official copy of the score on the Test of English as a Foreign Language (TOEFL).
3. Certification of financial responsibility.

Application forms must be submitted to the Admissions Office during the appropriate initial filing period. Supporting documents must be submitted early enough to allow for the processing of the application and necessary travel documents.

### RETURNING STUDENTS

Former students who have been absent from the University for two or more quarters must file an application for readmission. If the absence has been for two quarters only, and no other institution has been attended during the absence, no application fee is required. If the absence has been for three quarters or more, or if the student has attended another institution during the absence, the \$35 application fee must accompany the application for readmission. To be given full consideration, applications for readmission should be filed during the appropriate filing period. Summer Quarter is a regular quarter and is counted in determining the length of absence.

### HIGH SCHOOL STUDENTS

Students still enrolled in high school will be considered for enrollment in certain special programs if recommended by the principal and the appropriate campus department chair and if preparation is equivalent to that required of eligible California high school graduates. Such admission is only for a given program and does not constitute the right to continued enrollment.

### CAREER PLACEMENT

The campus may furnish, upon request, information concerning the subsequent employment of students who graduate from programs or courses of study which have the purpose of preparing students for a particular career field. This information includes data concerning average starting salary and the percentage of previously enrolled students who obtained employment. The information provided may include data collected from either graduates of the campus or graduates of all campuses in The California State University. Interested prospective students may request copies of the published information from the Director of Placement.

### ENGLISH PLACEMENT TEST

All entering freshmen and lower division students who enroll with fewer than 56 transferable semester units must complete the CSU English Placement Test (EPT) with the exception of students who present one of the following:

1. Satisfactory scores on the CSU English Equivalency Examination.
2. Score of 3, 4, or 5 on the English Composition Examination of the College Board Advanced Placement Program.
3. A score of 600 or above on the College Board Achievement Test in English Composition with Essay.
4. A score of 510 or above on the Verbal section of the College Board Scholastic Aptitude Test (SAT-Verbal).
5. A score of 23 or above on the ACT English Usage Test.
6. Completion of an acceptable college course in English composition of four-quarter or three-semester units with a grade of C or better.

Failure to take the English Placement Test at the earliest opportunity after admission may lead to administrative probation which, according to Section 41300.1 of Title 5, *California Administrative Code*, and CSU Executive Order 186, may lead to disqualification from further attendance. The results of the EPT will not affect admissions eligibility but will be used to

identify students who need special help in reading and writing in order to do college-level work. *Students may not enroll in freshman composition without taking the EPT.*

Information bulletins and registration materials for the EPT will be mailed to all students subject to these requirements. The materials also may be obtained from the Office of Admissions and Records.

### ENTRY-LEVEL MATHEMATICS REQUIREMENT

All students entering the CSU as of Fall 1983 who are subject to the 1983-84 or subsequent Catalog must demonstrate basic competence in mathematics. New freshmen must demonstrate competence by successful completion of the CSU Entry-Level Mathematics (ELM) test or qualifying for an exemption before they can enroll in courses which meet the General Education and Breadth Requirement for Quantitative Reasoning. Satisfactory completion of the Entry Level Mathematics requirement is a prerequisite for enrollment in *all* mathematics courses. Failure to take the Entry Level Mathematics Examination at the earliest opportunity after admission may lead to administrative probation which, according to Section 41300.1 of Title 5 of the *California Administrative Code*, CSU Executive Order 393, and CSU Executive Order 416, may lead to disqualification from further attendance. The results of the ELM test will not affect admissions eligibility. Transfer students who are subject to requirements in the 1983-84 or subsequent catalog must take the ELM test unless they have successfully completed (grade of C or better) a mathematics course certified for General Education-Quantitative Reasoning (intermediate algebra or above) at the time of transfer. Satisfactory performance on any of several alternate examinations may exempt students from taking this examination.

Information bulletins and registration materials for the ELM will be mailed to students subject to these requirements. The materials also may be obtained from the Office of Admissions and Records.

### CAL POLY MATHEMATICS PLACEMENT EXAMINATION

The Cal Poly Mathematics Placement Examination (MAPE) is an examination used to place students in the appropriate mathematics course. Students enrolling in MATH 118, 119, 120, 121, 131, 141, or 221 are subject to this exam. Failure to take the MAPE may delay enrollment in key courses with mathematics prerequisites.

Information bulletins and registration materials for MAPE are mailed to students admitted for fall quarter. Students enrolled in these classes admitted other quarters will receive in-class information. Questions regarding the MAPE may be directed to the Testing Office.

### ADMISSION OF POSTBACCALAUREATE AND GRADUATE STUDENTS

#### Postbaccalaureate Standing—Unclassified

For admission to unclassified postbaccalaureate standing, a student must: (a) hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association or have completed equivalent academic preparation as determined by an appropriate campus authority; (b) have attained a grade point of at least 2.5 ( $A = 4.0$ ) in the last 60 semester (90 quarter) units attempted; and, (c) have been in good standing at the last college attended. Admission to a California State University campus with postbaccalaureate unclassified standing does not constitute admission to graduate degree curricula.

#### Postbaccalaureate Standing—Classified

A student who is eligible for admission to a California State University campus in unclassified standing may be admitted to classified postbaccalaureate standing for the purpose of enrolling in a particular postbaccalaureate credential or certificate program, provided that such additional professional, personal, scholastic, and other standards, including qualifying examinations, as may be prescribed for the particular program by the appropriate campus authority, are satisfied.

#### Graduate Standing—Conditionally Classified

A student eligible for admission to a California State University campus under unclassified postbaccalaureate standing, but who has deficiencies in prerequisite preparation which in the

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opinion of the appropriate campus authority can be remedied by specified additional preparation, including qualifying examinations, may be admitted to an authorized graduate degree curriculum with conditionally classified graduate standing.

### Graduate Standing—Classified

A student eligible for admission to a California State University campus in unclassified or conditionally classified standing may be admitted to an authorized graduate degree curriculum of the campus as a classified graduate student if he or she satisfactorily meets the professional, personal, scholastic, or other standards for admission to the graduate degree curriculum including qualifying examinations, as the appropriate campus authority may prescribe. Only those applicants who show promise of success and fitness will be admitted to graduate degree curricula, and only those who continue to demonstrate a satisfactory level of scholastic competence and fitness shall be eligible to proceed in such curricula.

### ADVANCED PLACEMENT

The University grants credit toward its undergraduate degrees for successful completion of examinations of the Advanced Placement Program of the College Board. Students who present scores of three or better will be granted nine quarter units of college credit.

### CREDIT FOR MILITARY SERVICE

Nine quarter units of elective credit will be allowed toward graduation to any student with an honorable discharge submitting evidence of satisfactory completion of one year of training in the military service of the United States. Additional credit may be allowed in accordance with the recommendations of the American Council on Education.

Credit is not given for completion of the six-month Reserve Training Programs or for college level General Educational Development Tests. No grade points are assigned in connection with units of credit allowed for military service. The units allowed are not included in scholarship computations.

### CREDIT BY EXAMINATION

A regularly enrolled student may be permitted to obtain credit by examination for courses in subject matter fields in which he is especially qualified through previous education or experience and for which credit has not otherwise been given. A credit by examination request will not be considered for a course in which the student is enrolled, or for which a student has received a failing or NC at Cal Poly, or for which a student has previously unsuccessfully attempted credit by examination. A fee is charged for such an examination. The examination may include written, oral, or skills tests, or a combination of all three types, and will be sufficiently comprehensive to determine that the student has essentially the same knowledge and skills as those students who successfully complete the course. The grade received is entered on the student's permanent record. The grade may not be Credit/No Credit. The length of the examination will be consistent with the unit value of the course.

Credit toward partial completion of the general education-breadth requirements will be granted for the completion of specified tests of the general examination in the College Level Examination Program with an appropriate score, and up to 4 units of elective or course equivalent credit for each subject examination completed with an appropriate score. The maximum number of units of credit the University will grant for the successful completion of any combination of general and subject examinations of the College Level Examination Program will be 45 quarter units.

Credit for CLEP and other externally developed examinations will *not* be awarded if any of the following apply: (1) Examination previously taken within the past year; (2) Equivalent degree credit or duplicate credit has already been granted; (3) Credit has been granted for previous course work or for a previously completed more advanced or higher level examination; (4) Total amount of credit awarded for externally developed tests exceeds 45 quarter units (Advanced Placement Examination credit excluded from this limit).

Arrangements to obtain course credit by examinations may be made with the head of the department in which the course is taught. Units of credit received through this procedure may not apply toward the residence requirements for any of the degrees or credentials offered by the University.

Detailed instruction for applying for credit by examination may be obtained from the Records Office.

### PLANNED EDUCATIONAL LEAVE

The Planned Educational Leave Program makes it possible for students who obtain the necessary approval in advance to leave school for up to two calendar years without being subject to regular readmissions procedures.

1. Planned Educational Leave must be for purposes which will contribute to the student's educational objective.
2. A student on educational leave will be considered to be in continuous attendance for the purpose of returning to the same curriculum as that in effect at the time of the beginning of the leave.
3. A student on educational leave will not be required to apply for readmission or pay an application fee provided that: a) the student is in good academic standing, and returns in the same major and b) the student returns within the time period agreed on at the time of application for leave.
4. A student who decides to return earlier than planned must notify the Admissions Office in writing at least 30 days before the anticipated registration date.
5. An application for educational leave must be initiated and approved before the leave begins. Educational leaves will not be granted retroactively.

Application forms for Planned Educational Leaves may be obtained from the Admissions Office.

### AUDITING OF COURSES

An auditor is a student who is attending courses for no credit. The student must be registered with fees paid for the quarter in which the course is to be audited. A student may enroll to audit a course during the first week of instruction and no later than the first day to add a course. The deadline to change from audit to credit is the same as the last day to add a course. A student may change from credit to audit no later than the last day to drop a course without penalty.

In cases where class sections must be limited in enrollment, preference will be given to students enrolling for credit. Students may not enroll for audit classes at registration.

The student services fee and nonresident tuition fee are determined on the basis of the total units for which the student is enrolled including courses audited.

### DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES

The campus Admissions Office determines the residence status of all new and returning students for nonresident tuition purposes. Responses to items 29-45 on the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident will be classified as a nonresident.

The following statement of the rules regarding residency determination for nonresident tuition purposes is not a complete discussion of the law, but a summary of the principal rules and their exceptions. The law governing residence determination for tuition purposes by The California State University is found in *Education Code* Sections 68000-68090, 68121, 68123, 68124, 89705-89707.5, and 90408 and in Title 5 of the *California Administrative Code*, Sections 41900-41912. A copy of the statutes and regulations is available for inspection at the campus Admissions Office.

Legal residence may be established by an adult who is physically present in the state and who, at the same time, intends to make California his or her permanent home. Steps must be taken at least one year prior to the residence determination date to show an intent to make California the permanent home with concurrent relinquishment of the prior legal residence. The steps necessary to show California residency intent will vary from case to case. Included among the steps may be registering to vote and voting in elections in California; filing resident California state income tax forms on total income; ownership of residential property or continuous occupancy or renting of an apartment on a lease basis where one's permanent belongings are kept; maintaining active resident memberships in California professional or social

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organizations; maintaining California vehicle plates and operator's license; maintaining active savings and checking accounts in California banks; maintaining permanent military address and home of record in California if one is in the military service.

The student who is within the state for educational purposes only does not gain the status of resident regardless of the length of the student's stay in California.

In general, the unmarried minor (a person under 18 years of age) derives legal residence from the parent with whom the minor maintains his or her place of abode. The residence of a minor cannot be changed by the minor or the minor's guardian, so long as the minor's parents are living.

A married person may establish his or her residence-independent of spouse.

An adult alien may establish his or her residence, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States.

Nonresident students seeking reclassification are required by law to complete a supplemental questionnaire concerning financial independence.

The general rule is that a student must have been a California resident for at least one year immediately preceding the residence determination date in order to qualify as a "resident student" for tuition purposes. A residence determination date is set for each academic term and is the date from which residence is determined for that term. The residence determination dates for 1984-85 academic year are:

<i>Fall</i> .....	<i>September 20</i>
<i>Winter</i> .....	<i>January 5</i>
<i>Spring</i> .....	<i>April 1</i>
<i>Summer</i> .....	<i>July 1</i>

Questions regarding residence determination dates should be directed to the campus Admissions Office which can give you the residence determination date for the term for which you are registering.

There are exceptions from nonresident tuition, including:

1. Persons below the age of 19 whose parents were residents of California but who left the state while the student, who remained, was still a minor. When the minor reaches age 18, the exception continues for one year to enable the student to qualify as a resident student.
2. Persons who have been present in California with the intent of acquiring residence for more than a year before the residence determination date, and entirely self-supporting for that period of time.
3. Persons below the age of 19 who have lived with and been under the continuous direct care and control of an adult, not a parent, for the two years immediately preceding the residence determination date. Such adult must have been a California resident for the most recent year.
4. Dependent children and spouses of persons in active military service stationed in California on the residence determination date. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year. The exception, once attained, is not affected by retirement or transfer of the military person outside the state.
5. Military personnel in active service stationed in California on the residence determination date for purposes other than education at state-supported institutions of higher education. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year.
6. Certain credentialed, full-time employees of California school districts.
7. Full-time State University employees and their children and spouses. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for one year.
8. Certain exchange students.
9. Children of deceased public law enforcement or fire suppression employees, who were California residents, and who are killed in the course of law enforcement or fire suppression duties.



Any student, following a final campus decision on his or her residence classification, only may make written appeal to:

The California State University  
Office of General Counsel  
400 Golden Shore  
Long Beach, California 90802

within 120 calendar days of notification of the final campus decision of the classification. The Office of General Counsel may make a decision on the issue, or it may send the matter back to the campus for further review. Students classified incorrectly as residents or incorrectly granted an exception from nonresident tuition are subject to reclassification as nonresidents and payment of nonresident tuition in arrears. If incorrect classification results from false or concealed facts, the student is subject to discipline pursuant to Section 41301 of Title 5 of the *California Administrative Code*. Resident students who become nonresidents, and nonresident students qualifying for exceptions whose basis for so qualifying changes, must immediately notify the Admissions Office. Applications for a change in classification with respect to a previous term are not accepted.

The student is cautioned that this summation of rules regarding residency determination is by no means a complete explanation of their meaning. The student should also note that changes may have been made in the rate of nonresident tuition, in the statutes, and in the regulations between the time this catalog is published and the relevant residence determination date.

## REGISTRATION

All students are required to enroll in courses which meet the requirements of their major course of study insofar as these courses are available.

The schedule for registration and payment of fees is published in the "Class Schedule" which is on sale prior to the start of each quarter. Students should consult this booklet for detailed registration procedures.

Credit for course work completed is given only when the student is properly registered. A student is not properly registered until fees have been paid and quarterly registration materials have been filed with the Registrar's Office. Individuals are not permitted to attend courses unless they are officially registered as regular students, as approved extension students, or as enrolled auditors. See "Academic Policies, Audit."

## FEES AND EXPENSES

Fees are listed below in the amount in effect at the time this catalog was printed for informational purposes only. This list is not to be used as a schedule of current fees. Please consult the current Class Schedule for the fees that are applicable to the quarter in which you are registering.

### Student Services Fee

The Student Services Fee, established by the Board of Trustees in January 1975, is a reimbursement to the General Fund used to provide the following student support services:

- 1) Counseling: Counseling assists students in personal growth, value formation, and the resolution of personal problems which, especially in the period of young adulthood, may impede the learning process.
- 2) Testing: The Testing Office administers and interprets and, when necessary, develops tests used by Counseling, Career Planning and Placement, and other student support services. It also administers academic placement and advanced placement tests and conducts student profile surveys used in assessing the need for specific student support programs.
- 3) Career Planning and Placement: Career Planning Services focus the student on vocational and career opportunities related to a particular field of study. The Placement Office also assists students in preparing resumes, improving interviewing techniques, and in securing both part-time employment while students and full-time employment following graduation.

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- 4) **Social/Cultural Development:** The Social/Cultural Development Program provides both opportunities and direction for students in developing organizational skills, planning and implementing programs, developing and administering program budgets and in working effectively with others to achieve a common goal.
- 5) **Health Services:** Student Health Services aid students to maintain physical and mental health and to avoid health-related problems which prevent active participation in the educational program.
- 6) **Financial Aid Administration:** Although funds for grants and loans are provided by federal and state governments and through private benefactors, the administrative staff required to assist students in securing needed financial support is funded through Student Services Fee reimbursements.
- 7) **Housing Administration:** Not all campuses offer on-campus housing for students. Each campus, however, provides services to all students in their efforts to secure suitable housing near the campus and at a reasonable cost.
- 8) **Dean of Students:** Fifty percent of the administrative cost for coordination of student support programs has been funded by Student Services Fee revenue since 1973-74. The Dean provides leadership and direction for fee-supported programs as well as for other programs and personnel (e.g., residence halls, student union, EOP, disabled students) not receiving Student Services Fee support.



## Required State Fees for Regularly Enrolled Resident Students (subject to change):

Application fee (nonrefundable).....	\$35.00
Campus services card fee (each student, per card).....	5.00
Facilities fee (non-State funded, per quarter) .....	2.00
Student services fee (per quarter) .....	70.00
State University fee (undergraduates, per quarter):	
0-5.9 units.....	44.00
6 units or more .....	134.00
State University fee (graduate students, per quarter):	
0-5.9 units.....	56.00
6.0 units or more.....	146.00

## Additional State Fees (subject to change):

Transcript of record (varies with number ordered) .....	4.00
Late registration fee .....	25.00
Credit by examination fee (per class) .....	25.00
Failure to meet administratively required appointment or time limit.....	2.00 to 5.00
Library fees .....	see schedule in library
Thesis binding fee.....	2.00 to 10.00
Check returned for any cause .....	10.00
Housing (annual license, double occupancy, usually adjusted annually):	
Academic year (does not include deposit or installment charge) .....	1,350.00
Summer quarter (does not include deposit or installment charge) .....	450.00
Parking fees (less than 4-wheel vehicles, 25% of listed fee):	
Quarterly, nonreserved spaces.....	15.00
Quarterly pool (2 or more vehicles), each pool .....	15.00
Daily permits.....	0.50
Conference, short course or institute, per person.....	Estimated cost
Extension course fees (per quarter unit, usually adjusted annually):	
Lecture and discussion.....	35.00
Activity .....	44.00
Laboratory .....	64.00
Summer session fee (per quarter unit) .....	35.00
Nonresident tuition (per quarter unit) .....	78.00
Cooperative Education (per quarter unit) .....	39.00

## Auxiliary organization fees (subject to change):

Associated Students fee (required):	
Summer.....	8.00
Fall .....	15.00
Winter and spring quarters, each .....	10.00
University Union fee (required):	
Summer.....	10.00
Academic year each quarter .....	14.00
Meals (subject to change):	
19 meals per week, academic year.....	1,422.00
14 meals per week, academic year.....	1,290.00
Health fee (for optional services):	
Academic year .....	59.00
Quarterly.....	27.00
Sponsored Program fee (per quarter) .....	100.00

ALL FEES LISTED ARE SUBJECT TO CHANGE, WITHOUT NOTICE. MANY WILL PROBABLY BE RAISED FOR THE 1984-85 AND 1985-86 ACADEMIC YEARS. FOR CURRENT INFORMATION, CONSULT THE CLASS SCHEDULE FOR THE APPROPRIATE QUARTER.

No fees of any kind shall be required of or collected from those individuals who qualify for such exemption under the provisions of the Alan Pattee Scholarship Act.

### REFUND OF FEES

Details concerning fees which may be refunded, the circumstances under which fees may be refunded, and the appropriate procedure to be followed in seeking refunds may be obtained by consulting Section 41803 (parking fees), 41913 (nonresident tuition), 42019 (housing charges), and 41802 (all other fees) of Title 5, *California Administrative Code*. In all cases it is important to act quickly in applying for a refund. Information concerning any aspect of the refund of fees may be obtained from the Records Office or the University Cashier.

### DEBTS OWED TO THE UNIVERSITY

Should a student or former student fail to pay a debt owed to the institution, the university may "withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise or any combination of the above from any person owing a debt" until the debt is paid (see Title 5, *California Administrative Code*, Sections 42380 and 42381). For example, the institution may withhold permission to receive official transcripts of grades from any person owing a debt. If a student believes that he or she does not owe all or part of an unpaid obligation, the student should contact the campus business office. The business office, or another office on campus to which the student may be referred by the business office, will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.

### CREDIT CARDS

VISA and Master Charge bank credit cards may be used for payment of Student Fees. Use of these cards is limited to certain programs.

### PROCEDURE FOR THE ESTABLISHMENT OF A STUDENT BODY FEE

The law governing The California State University provides that a student body fee may be established by student referendum with the approval of two-thirds of those students voting. The Student Body Fee (also called the Associated Student Fee or ASI Fee) was established at California Polytechnic State University, San Luis Obispo by student referendum on April 8 and 9, 1981. The same fee can be abolished by a similar two-thirds approval of students voting on a referendum called for by a petition signed by 10% of the regularly enrolled students (*Education Code*, Section 89300). The level of the fee is set by the Chancellor. An increase in the student body fee may be approved by the Chancellor only following a referendum on the fee increase approved by a majority of students voting. Student body fees support a variety of cultural and recreational programs, child care centers, and special student support programs.



# Academic Programs and Policies

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## ACADEMIC PROGRAMS

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
<b>School of Agriculture and Natural Resources</b>		
	Agriculture	M.S.
	Specializations:	
	General Agriculture	
	International Agriculture	
	Mechanized Agriculture	
	Soil Science	
Agricultural Education Department	Agricultural Science	B.S.
	Concentrations:	
	Agricultural Mechanics	
	Agricultural Products and Processing	
	Agricultural Resources Management	
	Agricultural Supplies and Services	
	Animal Production	
	Ornamental Horticulture	
	Plant Production	
Agricultural Engineering Department	Agricultural Engineering	B.S.
	Mechanized Agriculture	B.S.
Agricultural Management Department	Agricultural Management	B.S.
	Options:	
	Agricultural Business Management	
	Farm Management	
Animal and Veterinary Science Department	Animal Science	B.S.
Crop Science Department	Crop Science	B.S.
	Fruit Science	B.S.
Dairy Science Department	Dairy Science	B.S.
	Options:	
	Husbandry	
	Manufacturing	
Food Science Department	Food Science	B.S.
Natural Resources Management Department	Natural Resources Management	B.S.
	Concentrations:	
	Environmental Services	
	Fishery and Wildlife Management	
	Forest Resources Management	
	Parks and Outdoor Recreation	
Ornamental Horticulture Department	Ornamental Horticulture	B.S.
	Concentrations:	
	Floriculture and Nursery Production	
	Horticulture Sales and Services	
	Landscape Industry	
Poultry Department	Poultry Industry	B.S.
Soil Science Department	Soil Science	B.S.

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<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
<b>School of Architecture and Environmental Design</b>		
Architectural Engineering Department	Architectural Engineering	B.S.
Architecture Department	Architecture	B.Arch., M.Arch.
City and Regional Planning Department	City and Regional Planning	B.S., M.C.R.P.
Construction Management Department	Construction Management	B.S.
Landscape Architecture Department	Landscape Architecture	B.S.
<b>School of Business</b>		
	Business Administration Specialization: Agribusiness	M.B.A.
Accounting Department	Business Administration Accounting	B.S.
Business Administration Department	Business Administration Concentrations: Financial Management Marketing Management	B.S.
Economics Department	Economics Concentrations: Business and Industrial Economics International Trade and Development Quantitative Economics	B.S.
Management Department	Business Administration Concentrations: Human Resources Management International Business Management Management Management Information Systems Production and Operations Management	B.S.
<b>School of Communicative Arts and Humanities</b>		
Art Department	Applied Art and Design Options: Graphic Design Photography	B.S.
English Department	English Minor: English	B.A., M.A.
Foreign Languages Department	Minors: French German Spanish	
Graphic Communications Department	Graphic Communications Options: Computer Graphic Communications Design Reproduction Packaging Printing Management	B.S.



<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
History Department	History	B.A.
Journalism Department	Journalism	B.S.
	Concentrations:	
	Agricultural Journalism	
	Broadcast Journalism	
	News-Editorial	
	Public Relations	
Music Department	Minor: Music	
Philosophy Department	Minor: Philosophy	
Political Science Department	Political Science	B.A.
	Concentrations:	
	International Affairs	
	Pre-Law	
	Public Administration	
	Teaching	
	Urban Studies	
	Minor: Public Administration	
Social Sciences Department	Social Sciences	B.S.
	Concentrations:	
	Community Studies	
	Criminal Justice	
	Cross-Cultural Studies	
	Social Sciences (Teaching)	
	Social Services	
Speech Communication Department	Speech Communication	B.A.
	Concentration:	
	Communication Studies	
	Minor: Speech Communication	
<b>School of Engineering and Technology</b>		
	Engineering	M.Engr.
	Primary fields of study:	
	Aeronautical Engineering	
	Civil and Environmental Engineering	
	Computer Engineering	
	Electrical Engineering	
	Electronic Engineering	
	Industrial Engineering	
	Mechanical Engineering	
	Engineering Science	B.S.
Aeronautical and Mechanical Engineering Department	Aeronautical Engineering	B.S.
	Mechanical Engineering	B.S.
	Concentrations:	
	General	
	Heating, Ventilating, Air Conditioning, and Solar Petroleum	
Civil and Environmental Engineering Department	Civil Engineering	B.S.
	Environmental Engineering	B.S.
Electronic and Electrical Engineering Department	Electrical Engineering	B.S.
	Electronic Engineering	B.S.

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<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
Engineering Technology Department	Engineering Technology Options: Air Conditioning-Refrigeration Technology Electronic Technology Manufacturing Processes Technology Mechanical Technology Welding Technology	B.S.
Industrial Engineering Department	Industrial Engineering Concentrations: Production Management Systems Analysis	B.S.
Industrial Technology Department	Industrial Arts Industrial Technology Options: Industrial Education Industrial Management	M.A. B.S.
Metallurgical and Welding Engineering Department	Metallurgical Engineering	B.S.
<b>School of Human Development and Education</b>		
	Liberal Studies	B.A.
Child Development and Home Economics Department	Child and Family Development Concentrations: Child Development Family Studies Dietetics and Food Administration Home Economics	B.S.    B.S.
Education Department	Counseling Education Specializations: Administrative Services Counseling and Guidance Curriculum and Instruction Reading Special Education Special Interest Option	B.S., M.S. M.S. M.A.
Physical Education and Recreation Administration Department	Physical Education Options: Athletic Coaching Health Education Teaching Physical Education Recreation Administration Concentrations: Private/Commercial Recreation Therapeutic Recreation	B.S.      M.S. B.A.
Psychology Department		

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
<b>School of Science and Mathematics</b>		
Biological Sciences Department	Biological Sciences Concentrations: Anatomy-Physiology Biology Botany Marine Biology Plant Pathology-Entomology	B.S.
	Biological Sciences	M.S.
	Environmental and Systematic Biology	B.S.
	Microbiology	B.S.
	Options: General Microbiology Medical Laboratory Technology	
Chemistry Department	Biochemistry	B.S.
	Chemistry	B.S., M.S.
Computer Science and Statistics Department	Computer Science	B.S., M.S.
	Statistics	B.S.
Mathematics Department	Mathematics	B.S.
	Options: Applied Mathematics Finite Mathematics Mathematics Teaching	
	Mathematics	M.S.
	Specializations: Applied Mathematics Mathematics Teaching	
Military Science Department		
Physics Department	Physical Science	B.S.
	Physics	B.S.



**ENROLLMENT IN UNDERGRADUATE AND GRADUATE PROGRAMS, AND  
ENROLLMENT OF MEN AND WOMEN STUDENTS, BY SCHOOL AND  
MAJOR, FALL 1983**

Schools and Major Curricula	Under-graduate Programs	Graduate Programs	Men	Women	Total Enrollment
<i>School of Agriculture and Natural Resources</i>					
Agriculture (M.S.)	—	73	52	21	73
Agricultural Education/Science	126	—	50	76	126
Agricultural Engineering	177	—	151	26	177
Agricultural Management	900	—	559	341	900
Animal Science	599	—	200	399	599
Crop Science	232	—	194	38	232
Dairy Science	128	—	78	50	128
Food Science	129	—	47	82	129
Fruit Science	66	—	52	14	66
Mechanized Agriculture	127	—	123	4	127
Natural Resources Management	287	—	185	102	287
Ornamental Horticulture	480	—	277	203	480
Poultry Industry	48	—	37	11	48
Soil Science	70	—	54	16	70
Totals	3,369	73	2,059	1,383	3,442
<i>School of Architecture and Environmental Design</i>					
Architectural Engineering	191	—	157	34	191
Architecture	804	25	631	198	829
City and Regional Planning	103	18	83	38	121
Construction	159	—	149	10	159
Landscape Architecture	190	—	114	76	190
Totals	1,447	43	1,134	356	1,490
<i>School of Business</i>					
Business Administration	1,317	58	637	738	1,375
Economics	138	—	99	39	138
Totals	1,455	58	736	777	1,513
<i>School of Communicative Arts and Humanities</i>					
Applied Art and Design	247	—	79	168	247
English	200	19	48	171	219
Graphic Communications	331	—	173	158	331
History	128	—	68	60	128
Journalism	232	—	67	165	232
Political Science	223	—	136	87	223
Social Sciences	304	—	114	190	304
Speech Communication	133	—	38	95	133
Totals	1,798	19	723	1,094	1,817

**ENROLLMENT IN UNDERGRADUATE AND GRADUATE PROGRAMS, AND  
ENROLLMENT OF MEN AND WOMEN STUDENTS, BY SCHOOL AND  
MAJOR, FALL 1983 (Continued)**

Schools and Major Curricula	Under- graduate Pro- grams	Grad- uate Pro- grams	Men	Women	Total Enroll- ment
<i>School of Engineering and Technology</i>					
Aeronautical Engineering	278	—	245	33	278
Civil Engineering	333	—	266	67	333
Electrical Engineering	244	—	206	38	244
Electronic Engineering	634	—	576	58	634
Engineering (M. Engr.)	—	20	19	1	20
Engineering Science	47	—	36	11	47
Engineering Technology	379	—	350	29	379
Environmental Engineering	132	—	97	35	132
Industrial Arts	57	14	66	5	71
Industrial Engineering	209	—	128	81	209
Industrial Technology	200	—	156	44	200
Mechanical Engineering	647	—	576	71	647
Metallurgical Engineering	100	—	90	10	100
Totals	3,260	34	2,811	483	3,294
<i>School of Human Development and Education</i>					
Child Development	353	—	12	341	353
Dietetics and Food Administration	275	—	8	267	275
Education	—	303	80	223	303
Home Economics	410	14	2	422	424
Liberal Studies	318	—	22	296	318
Physical Education	366	20	155	231	386
Recreation Administration	162	—	40	122	162
Vocational Education	1	—	1	—	1
Totals	1,885	337	320	1,902	2,222
<i>School of Science and Mathematics</i>					
Biochemistry	132	—	70	62	132
Biological Sciences	452	20	214	258	472
Chemistry	79	8	54	33	87
Computer Science	455	61	321	195	516
Environmental and Systematic Biology	82	—	35	47	82
Mathematics	308	12	190	130	320
Microbiology	98	—	28	70	98
Physical Science	18	—	15	3	18
Physics	87	—	79	8	87
Statistics	33	—	20	13	33
Totals	1,744	101	1,026	819	1,845
Campus Totals	14,958	665	8,809	6,814	15,623

## ACADEMIC REQUIREMENTS

Curricula leading to graduation with the degree of bachelor of science or bachelor of arts are offered in agriculture, architecture, engineering, business, and in the applied arts and applied sciences. Occupational majors in these fields are described under the appropriate school or division heading in this catalog. In addition, Cal Poly offers the following degrees: master of science, master of arts, master of architecture, master of business administration, master of city and regional planning, master of engineering. It also offers the bachelor of vocational education degree and a technical certificate in selected agricultural fields. Programs leading to teaching credentials authorizing service in the public schools are described under the heading "Teacher Preparation Programs."

### EVALUATION FOR GRADUATION

A student should request a graduation evaluation approximately four quarters prior to the student's anticipated graduation date. After receiving an evaluation, the student should contact the Graduation Section of the Records Office to file for graduation. The actual date of graduation will be the end of the quarter when all requirements have been met.

### Diploma Regulations

Upon filing for graduation, the student may choose to purchase one or more diplomas which show the student's anticipated graduation date. The diploma will be issued to the student if the student completes degree requirements by the specified graduation date. The student has one additional quarter to finalize any incomplete grades and still maintain the original graduation date. Only diplomas which reflect the actual date of graduation will be issued to students.

### DOUBLE MAJORS

The student will normally meet graduation requirements for a degree in one of the major curricula.

It is permissible for a student to be granted a bachelor's degree with two majors if the complete requirements of both major curricula are satisfied at the same time.

No more than one diploma or degree will be granted to the same student at one commencement. In the event that a student has completed the requirements for two different degrees, such as a B.A. and a B.S., the student will be required to declare one major as the degree major in order to determine which degree will be awarded.

A student who desires to submit only one senior project covering two graduation majors must file a petition for special consideration prior to the date of commencing the senior project.

### SECOND BACHELOR'S DEGREE

A qualified student who holds a bachelor's degree from Cal Poly or from another accredited institution may be awarded a second bachelor's degree in a different major when all requirements have been met and providing a minimum of 45 units of course work for Cal Poly graduates and 50 units for graduates from another accredited institution has been completed in residence after the requirements for the first degree have been fulfilled. A senior project is required for each bachelor's degree.

### MINORS

A minor is not required for graduation but may be used to complement the program of study. Units used to satisfy the degree major requirements may not be applied to a minor. A grade point average of C or better is required.

A student selecting a minor program must satisfy the requirements for a major and a minor field as designated in the respective programs. Selection of a major and a minor from the same discipline is not permitted.

The minor offers an integrated and coherent pattern of course work, with at least half of the units at the 300-400 level. A minor consists of 24 to 30 units; a minimum of one-half the required course work toward a minor must be completed in residence. Courses in the minor may not be counted toward the major, but may be used to satisfy support and general education requirements.

The student indicates the minor declaration at the time he/she files for graduation in the Records Office. The completion of the minor will be noted on the academic record. In no case will a diploma be awarded for the minor.

Minors are available in Music, French, German, Spanish, English, Speech Communication, Philosophy, and Public Administration. Information on the curriculum requirements can be obtained by contacting the department offering the minor.

## BACHELOR'S DEGREES

### GENERAL REQUIREMENTS FOR GRADUATION

All candidates for a bachelor's degree shall have completed the requirements in one of the listed curricula with a minimum "C" grade average for all units in the major, and shall have earned a total number of grade points at least equal to twice the number of units attempted. For this purpose courses comprising the major are identified on curriculum evaluation sheets available from the Evaluations Office. Transfer students, in their work taken at this University, must earn a number of grade points at least equal to twice the number of units attempted. All candidates for these degrees shall have earned not less than 50 quarter units in residence, and shall have earned at least 30 of these units among the last 40 units counted toward the degree. Thirty-six of these units shall be earned in upper division courses and 18 of the units shall be in the major. (Title 5, Section 40403.) (Extension credit or credit by examination may not be used to fulfill the residence requirement.)

Candidates for the bachelor of science degree (except in engineering) must present from 186 to 198 units for graduation and candidates in engineering must present from 200 to 210 units for graduation according to the approved curriculum for each major. Candidates for the bachelor of arts degree must present 186 units for graduation according to the approved curriculum for each major. Exemption from required courses by waiver, substitution, or examination does not reduce the total required units for each degree.

### GRADUATION WRITING REQUIREMENT

The Board of Trustees of the California State University has mandated that all students earning undergraduate or graduate degrees in the CSU must be certified as proficient in writing at the upper-division level. At California Polytechnic State University, San Luis Obispo, students may meet the Graduation Writing Requirement through one of three options:

1. Pass the Junior Writing Test.
2. Pass an approved 300-level composition course with a grade of "C" or better.
3. Pass an approved 300-level literature course with a grade of "C" or better AND receive certification of proficiency in writing from the instructor.

Students must earn proficiency after reaching 90 units. Students will be eligible for the Junior Writing Test for three quarters after earning 90 units, and those who need additional quarters of eligibility may apply for an extension.

All questions about the Graduation Writing Requirement should be directed to the Writing Skills Program Office at 546-2067.

### GENERAL EDUCATION AND BREADTH REQUIREMENTS

General Education and Breadth requirements in the CSU are so designed that, taken with the major depth program and elective units presented by the candidate for the bachelor's degree, they will assure that graduates from the several campuses in the system have made noteworthy progress toward becoming truly educated persons. Particularly, the purpose of the breadth requirements is to provide means whereby graduates:

- a) will have achieved the ability to think clearly and logically, to find and critically examine information, to communicate orally and in writing, and to perform quantitative functions;
- b) will have acquired appreciable knowledge about their own bodies and minds, about how human society has developed and how it functions, about the physical world in which they live, about the other forms with which they share that world, and about the endeavors and legacies of their civilizations; and
- c) will have come to an understanding of the principles, methodologies, value systems, and thought processes employed in human inquiries.

## 48 Academic Requirements

General Education at Cal Poly is so designed that, in addition to the objectives mentioned, graduates will have also achieved at least a rudimentary knowledge and understanding of technology.

All the requirements which follow are to be governed by the following general regulation: *Except where expressly prohibited, courses taken to satisfy General Education and Breadth requirements may also simultaneously satisfy requirements in any other portion of the student's curriculum.*

### Distribution Area A

A minimum of 14 quarter units in communication in the English language, to include both oral communication and written communication, and in critical thinking, to include consideration of common fallacies in reasoning.

All students must complete ENGL 114 before taking Critical Thinking. Expository Writing and Critical Thinking must be completed before taking SPC 201 or SPC 202 or ENGL 215 or ENGL 218.

- |  |          |
|--|----------|
| 1. ENGL 114 Writing: Exposition (4)                | GEB A.1. |
| 2. Select one: ENGL 125 Critical Thinking (3)      | GEB A.2. |
| PHIL 125 Critical Thinking (3)                     |          |
| SPC 125 Critical Thinking (3)                      |          |
| 3. Select one: SPC 201 Public Speaking (3)         | GEB A.3. |
| SPC 202 Principles of Speech (3)                   |          |
| 4. Select one: ENGL 215 Writing: Argumentation (4) | GEB A.4. |
| ENGL 218 Writing: Argumentation and Reports (4)    |          |

### Distribution Area B

A minimum of 18 quarter units to include inquiry into the physical universe and its life forms, with some immediate participation in laboratory activity, and into mathematical concepts and quantitative reasoning and their applications.

- |                               |          |
|-------------------------------|----------|
| 1. Physical and Life Sciences | GEB B.1. |
|-------------------------------|----------|

All students must complete a minimum of nine units from the approved list of courses in physical and life sciences, at least one course in each. At least one of the courses selected must include a laboratory.

- |                       |            |
|-----------------------|------------|
| (a) Physical Sciences | GEB B.1.a. |
|-----------------------|------------|

Courses may be selected as follows:

ASTR Any lower division course

CHEM Any lower division course except 106, 200, 252, 253

GEOL Any course except 321. 206 can be selected if GEOL 201 or 204 have been completed.

PHYS Any lower division course except 100, 134, 137, 200, 206, 207, 256, 257

PSC Any lower division course

Any upper division physical science course having one of the above as a prerequisite may also be selected with the exception of "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, "Senior Project" courses, and CHEM 405, 419, 457, 458, 481, 482, all 500 courses; PHYS 405, 407, 408, 409, 416; PSC 424, 436.

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|-------------------|------------|
| (b) Life Sciences | GEB B.1.b. |
|-------------------|------------|

Courses may be selected as follows:

BACT 221 General Bacteriology (4)

BIO Any lower division course except 100, 253 and 255

BOT Any lower division course except 238

ZOO 131 General Zoology (4)

ZOO 132 General Zoology (4)

Any 300-level life science course having one of the above as a prerequisite may also be selected with the exception of BIO 321, 342.



**2. Mathematics and Statistics****GEB B.2.**

All students must complete a minimum of two courses in mathematics and statistics, at least one of which must be mathematics.

Students may select from the courses listed below, or any mathematics or statistics courses having one of these as a prerequisite, with the exception of "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, "Senior Project" courses, and MATH 327, 403, 424, 435; STAT 330, 421, 512.

MATH 114 College Algebra (3)

MATH 115 Trigonometry (3)

MATH 118 Pre-Calculus Algebra (4)

MATH 119 Pre-Calculus Trigonometry (3)

MATH 120 College Algebra and Trigonometry (5)

MATH 328 Modern Elementary Mathematics (3)

STAT 211 Elementary Probability and Statistics (3)

STAT 251 Statistical Inference for Management I (3)

STAT 321 Statistical Analysis (3)

**Distribution Area C**

A minimum of 18 quarter units among the arts, literature, philosophy and foreign languages.

**1. Critical Reading****GEB C.1.**

A minimum of three lower division courses in literature and philosophy, at least one course in each, selected from the following:

ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4)

ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4)

ENGL 240 American Tradition in Literature (4)

ENGL 251 Great Books of World Literature: Classical and Ancient World (3)

ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)

ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3)

PHIL 230 Philosophical Classics (3)

PHIL 231 Philosophical Classics (3)

**2. Fine and Performing Arts****GEB C.2.**

A minimum of one lower division course selected from the following:

ART 111 Introduction to Art (4)

ART 112 Survey of Art History (3)

MU 101 Materials of Music-Theory I (3)

MU 204 Appreciation of Music (3)

TH 220 Introduction to Theatre (3)

**3. Electives in Literature, Philosophy, and the Arts****GEB C.3.**

Select remaining units from courses listed above or from the following list. At least three units must be at the upper division level. Courses offered by the student's major department cannot be counted in the elective portion of Distribution Area C.

ARCH 317 History of Architecture (2)

ARCH 318 History of Architecture (2)

ARCH 319 History of Architecture (2)

ART 314 History of Photography: Images and Processes (4)

ENGL 330 British Literature: Medieval Period (4)

ENGL 331 British Literature: The Renaissance (4)

ENGL 332 British Literature: The Enlightenment (4)

ENGL 333 British Literature: Romanticism (4)

ENGL 334 British Literature: The Victorians (4)

ENGL 339 Introduction to Shakespeare (3)

ENGL 340 American Literature to 1860 (4)

ENGL 341 American Literature: 1860-1914 (4)

ENGL 342 American Literature: 1914 to the Present (4)

ENGL 350 Modern Novel (3)

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ENGL 351 Modern Poetry (3)  
ENGL 352 Modern Drama (3)  
ENGL 370 World Cinema (4)  
ENGL 380 Contemporary Literary Ideas (3-4)  
FORL 101 Foreign Language (3)  
FORL 102 Foreign Language (3)  
FORL 103 Foreign Language (3)  
FR 101 Elementary French (5)  
FR 102 Elementary French (5)  
FR 103 Elementary French (5)  
FR 201 Intermediate French (3)  
FR 202 Intermediate French (3)  
FR 203 Intermediate French (3)  
FR 305 Readings in French Literature (3)  
FR 405 French Literature in English Translation (3)  
GER 101 Elementary German (5)  
GER 102 Elementary German (5)  
GER 103 Elementary German (5)  
GER 201 Intermediate German (3)  
GER 202 Intermediate German (3)  
GER 203 Intermediate German (3)  
GER 305 Significant Writers in German (4)  
GER 405 German Literature in English Translation (3)  
HUM 320 Future Studies (3)  
HUM 350 Aesthetics (3)  
HUM 402 Values and Technology (3)  
MU 209 Jazz Styles (3)  
MU 404 History of Music (3)  
MU 405 History of Music (3)  
MU 406 History of Music (3)  
PHIL 305 Judeo-Christian Religions (3)  
PHIL 306 Asian Religions (3)  
PHIL 307 Philosophy of Religion (3)  
PHIL 308 Islamic Religions (3)  
PHIL 311 History of Greek Philosophy (3)  
PHIL 312 History of Medieval Philosophy (3)  
PHIL 313 History of Modern Philosophy (3)  
PHIL 314 19th and 20th Century European Philosophy (3)  
PHIL 315 Contemporary Philosophy (3)  
PHIL 321 Philosophy of Science (3)  
PHIL 331 Ethics (3)  
PHIL 333 Political Philosophy (3)  
PHIL 335 Social Ethics (3)  
PHIL 337 Professional Ethics (3)  
PHIL 341 Philosophy of Art (3)  
SPAN 101 Elementary Spanish (5)  
SPAN 102 Elementary Spanish (5)  
SPAN 103 Elementary Spanish (5)  
SPAN 201 Intermediate Spanish (3)  
SPAN 202 Intermediate Spanish (3)  
SPAN 203 Intermediate Spanish (3)  
SPAN 305 Significant Writers in Spanish (4)  
SPAN 405 Spanish Literature in English Translation (3)  
SPC 330 Classical Rhetorical Theory (4)  
TH 327 Theatre History and Literature (3)  
TH 328 Theatre History and Literature (3)

## Distribution Area D

A minimum of 18 quarter units dealing with human social, political, and economic institutions and behavior and their historical background.

1. *Title 5, Section 40404 Requirements:* GEB D.1.  
     HIST 204 Growth of American Democracy (3)  
     POLS 210 American and California Government (3)
2. HIST 315 Modern World History (3) GEB D.2.
3. Select at least *one* course: GEB D.3.  
     ECON 201 Survey of Economics (3)  
     ECON 211 Principles of Economics (3)  
     ECON 222 Macroeconomics (4)
4. Select at least *one* course from each group:  
     Group a: GEB D.4.a.  
         ANT 201 Cultural Anthropology (3)  
         GEOG 150 Human Geography (3)  
         SOC 105 Introduction to Sociology (3)  
     Group b: GEB D.4.b.  
         Courses offered by the student's major department cannot be counted as satisfying the requirements of this group  
         ANT 360 Human Cultural Adaptation (3)  
         BUS 404 Governmental and Social Influences on Business (4)  
         ECON 304 Comparative Economic Systems (3)  
         ECON 325 Underdevelopment and Economic Growth (3)  
         GEOG 308 Global Geography (3)  
         POLS 370 Contemporary Global Political Issues (3)  
         SOC 309 World Social System and Its Problems (3)  
         SOC 315 Race Relations (3)  
     Note: The following majors are exempt from the specific requirement of Group b: Agricultural Engineering, Aeronautical Engineering, Architectural Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Engineering Technology, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical Engineering.

## Distribution Area E

A minimum of 5 quarter units in study designed to equip human beings for lifelong understanding and development of themselves as integrated physiological, social, and psychological entities. Students selecting BIO 220 may count 2 units in Area B and 2 units in Area E.

1. Select *one*: PSY 201 General Psychology (3) GEB E.1.  
     PSY 202 General Psychology (3)
2. Select *one*: BIO 220 Physiology and Biological Adaptation (4) GEB E.2.  
     DFA 210 Nutrition (3)  
     HE 210 Nutrition (3)  
     PE 250 Health Education (2)  
     PSY 304 Comparative and Physiological Psychology (3)

## Distribution Area F

A minimum of 6 quarter units in courses designed to acquaint students with an awareness of how technology influences and is influenced by today's world.

1. Computer Science GEB F.1.  
     At least one course in Computer Science. This requirement may be met by taking any course bearing a CSC prefix; or, AM 250, ENGR 251, or EDES 250. "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, and "Senior Project" courses may not be used to satisfy this requirement.
2. Select at least *one* course from the following: GEB F.2.  
     AERO 102 Introduction to General Aviation (3)  
     AG 301 Agriculture and American Life (3)  
     ARCH 312 Home and Community Design (3)  
     ASCI 202 Feeds and Feeding (5)  
     ASCI 230 General Animal Science (4)  
     CRP 211 Introduction to Urbanization (3)  
     CRP 212 Introduction to Urban Planning (3)  
     CRSC 230 General Field Crops (4)

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DH 230 General Dairy Husbandry (4)  
DM 230 General Dairy Manufacturing (4)  
ENGR 301 Technology in the 20th Century (3)  
ENVE 324 Introduction to Air Pollution (3)  
ENVE 330 Environmental Quality Control (3)  
FDSC 230 Elements of Food Processing (4)  
FRSC 230 California Fruit Growing (4)  
IT 125 Industrial Wood Processes (3)  
IT 130 Automotive Fundamentals (2)  
IT 141 Plastics Processes and Applications (1)  
IT 233 Metal Technology (3)  
LA 201 Introduction to Landscape Architecture (2)  
LA 213 Site and Terrain Analysis (3-4)  
LA 311 History of Landscape Architecture (3)  
LA 321 Concepts in Environmental Decision Making (3)  
ME 221 Solar Energy (3)  
OH 230 Ornamental Gardening (3)  
PI 121 Poultry Industry Development (4)  
PI 222 Poultry Products, Processing and Marketing (3)  
PI 230 General Poultry Production (3)  
PI 305 Game Bird Propagation and Management (3)  
PI 306 Game Bird Propagation and Management Laboratory (1)  
SS 121 Soils (4)  
VGSC 230 General Vegetable Crops (4)

Students in the Schools of Agriculture and Natural Resources, Architecture and Environmental Design, and Engineering and Technology are exempt from the requirements of this section (F.2). They may apply a maximum of 3 units from their major toward the satisfaction of the 12-unit upper division General Education requirement.

### MASTER'S DEGREES

Cal Poly offers graduate programs leading to the master's degree in fifteen areas. Curricula for the master's degrees are briefly outlined in the appropriate departmental sections of this catalog. For complete requirements for graduate study and for the master's degrees consult the *Graduate Studies Bulletin*.

### TEACHER PREPARATION PROGRAMS

California Polytechnic State University is authorized by the Commission for Teacher Credentialing to prepare candidates and recommend for the following credentials:

Multiple Subject Instruction (as commonly practiced in  
California elementary schools)  
Single Subject Instruction (as commonly practiced in  
California high schools and most junior high schools)  
Administrative Services  
Pupil Personnel Services  
Reading Specialist  
Special Education (Learning handicapped and Severely Handicapped) Specialist  
Bilingual Emphasis for Multiple and Single Subject Instruction

Further information, requirements, and procedures for entering a particular credential program may be obtained from the Education Department Credentials Office and the appropriate credential program coordinator. A bulletin, Teaching Credential Requirements for Single Subject and Multiple Subject Instruction, is available upon request from the Education Department.

Approved University degree majors which have received examination waiver status for a teaching credential are for Multiple Subject Instruction: Liberal Studies; and for Single Subject Instruction: Agriculture (12 majors), Agricultural Science, Biological Sciences, English, History, Home Economics, Industrial Technology, Mathematics, Physical Education, Physical Sciences, Political Science, Social Sciences.

## TWO-YEAR TECHNICAL CURRICULA IN AGRICULTURE

All candidates for a technical certificate shall have completed 98 quarter units of courses approved by the department granting the certificate, shall have been in residence at least two quarters immediately preceding graduation, shall have earned not less than 32 quarter units in residence, and shall have earned a total number of grade points at least equal to twice the number of units attempted.

## SPECIAL INSTRUCTIONAL SERVICES

### COOPERATIVE EDUCATION PROGRAM

Cal Poly's Cooperative Education Program is one of the largest programs of its kind in the Western United States. The program is designed to meet unique educational needs of students by providing practical work experience directly related to academic fields of study and career objectives through alternating periods of on-the-job training in business, industry, and government with periods of classroom study.

Students participating in the Cooperative Education Program at Cal Poly are given the opportunity to work with professionals in their fields of study and to explore career choices from the vantage point of the work place. The experience gained through participation in a Cooperative Education assignment is especially beneficial to students who wish to expand their employment opportunities upon graduation. Including Cooperative Education as part of their academic program offers students the opportunity to enhance their on-campus study with alternating periods of supervised full-time, off-campus paid employment. Students who participate in this program gain marketable knowledge, earn academic credit, receive competitive wages, and develop maturity and self confidence.

While the learning experience is the primary objective of Cooperative Education, the Program is also a method through which students can finance a portion of their education. Cooperative Education students find that the income from their training assignments can significantly reduce portions of their university-related expenses. In addition, Co-op students will invariably be hired at a higher level than graduates who are making their initial entry into the job market without the advantage of the Cooperative Education experience.

Students with a GPA of 2.0 or higher and who have completed their freshman year (or one quarter in residence for transfer students) are eligible to register with the Cooperative Education Office and begin the Co-op job search process. The Cooperative Education Office provides assignment opportunities for students with employers located primarily in California and the Western United States. However, placement is not limited to this region. Students also are placed in other parts of the United States and abroad. The Cooperative Education Office is continually seeking new business, industry, and government contacts in order to provide appropriate employment for interested students.

During their three to six months of work experience, students receive on-the-job evaluations by their immediate supervisors and by University Co-op coordinators. They are also required to write a term paper, do a task analysis, keep a log, and meet with their Cooperative Education coordinator for a debriefing interview upon their return to campus.

Cal Poly's goal is to enable all students who desire to do so to benefit from this unique educational program. Additional information regarding the program may be obtained from the Cooperative Education Office located in Chase Hall or from the Cooperative Education department coordinator within each academic department.

### INSERVICE TRAINING IN AGRICULTURE

Cal Poly plays an active role in the inservice training of high school and community college teachers of agriculture by providing instructional staff and facilities for workshops and training programs cooperatively sponsored by the University and the State of California.

The campus provides an annual summer skills program. The content varies, depending upon the needs and desires of the teachers as these are expressed through the California Agricultural Teachers Association. University faculty members provide up-to-date training in the technical phases of agriculture and also contribute to the professional improvement of teachers by offering instruction in teaching methods.

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The annual summer conference of the California Agricultural Teachers Association is held at the campus with an attendance of over 500 persons. Facilities, special speakers, exhibits, and other services are provided.

### INSTITUTIONAL AND FINANCIAL ASSISTANCE

The following information concerning student financial assistance may be obtained from the Director, Financial Aid, Administration 213, 546-2927:

1. Student financial assistance programs available to students who enroll at California Polytechnic State University
2. The methods by which such assistance is distributed among student recipients who enroll at California Polytechnic State University
3. The means, including forms, by which application for student financial assistance is made and requirements for accurately preparing such application
4. The rights and responsibilities of students receiving financial assistance
5. The standards which the student must maintain in order to be considered to be making satisfactory progress for the purpose of establishing and maintaining eligibility for financial assistance.

The following information concerning the cost of attending Cal Poly is available from the Director, Financial Aid, Administration 213, 546-2927. This information includes:

1. Fees and tuition (where applicable)
2. Estimated costs of books and supplies
3. Estimates of typical student room and board costs or typical commuting costs
4. Any additional costs of the program in which the student is enrolled or expresses a specific interest.

Information concerning the refund policy of Cal Poly for the return of unearned tuition and fees or other refundable portions of costs is available from the Registrar, Administration 219, 546-2541.

Information concerning the academic programs of Cal Poly may be obtained from the Provost, Administration 305, 546-2186. This information may include:

1. The current degree programs and other educational and training programs
2. The instructional, laboratory, and other physical plant facilities which relate to the academic program
3. The faculty and other instructional personnel
4. Data regarding student retention at Cal Poly and, if available, the number and percentage of students completing the program in which the student is enrolled or expressed interest
5. The names of associations, agencies, or governmental bodies which accredit, approve, or license the institution and its programs, and the procedures under which any current or prospective student may obtain or review upon request a copy of the documents describing the institution's accreditation, approval, or licensing.

Information regarding special facilities and services available to handicapped students may be obtained from Disabled Student Services, University Union 119A, 546-1395.

### SERVICES TO VOCATIONAL AGRICULTURE

Services to vocational agriculture departments in the secondary schools of California are provided by the campus staff through such activities as: visiting vocational agriculture departments to discuss with teachers and students dairy, animal husbandry, deciduous and citrus fruits, field and truck crops, poultry, farm mechanics, farm management, and other problems, including computer applications to agriculture; writing for agricultural magazines; assisting high school vocational agriculture departments to solve educational and agricultural problems through correspondence; judging of livestock, poultry, crops and other products at fairs; furnishing of breeding stock and hatching eggs to improve herds and flocks owned by Future Farmers throughout the State; and preparing a variety of teaching aids. These services are provided through a cooperative arrangement with the State of California.

Other services to vocational agriculture are rendered by the Instructional Materials Program sponsored by the University to create a variety of visual aids for educational use.

### EXTENDED EDUCATION

The university's extended education programs provide a variety of services to residents of San Luis Obispo, Santa Barbara, and southern Monterey Counties. Extended education programs are self-supporting through student enrollment fees or agency funding. A quarterly bulletin listing the programs and courses is available free from the Extended Education Office. The following programs are among the many services offered:

#### Extension Programs

The extension program provides a way to earn college credit, acquire skills, enhance career opportunities, gain relicensure credit or broaden awareness of today's world without applying for formal admission to the university. Extension courses are offered at various locations throughout the tri-counties. Enrollment does not imply formal admission to the university. The maximum extension credit which may be accepted toward the bachelor's degree is 36 quarter units. No more than 13 quarter units may be counted toward the master's degree.

Extension students may also take regular on-campus courses on a space-available basis through the concurrent enrollment program. *Extension fees and unit limitations apply to concurrent enrollment students.* Petitions and application forms may be obtained from the Extended Education Office.

#### Conferences and Workshops

The university provides facilities, faculty and staff for programs of special design appropriate to its educational objectives. These professional conferences, workshops, seminars and short courses are administered by and applications may be obtained from the Extended Education Office. Programs are scheduled throughout the year with the major concentration during the summer.

#### Special Sessions

Special sessions are programs or courses which earn residence credit outside of the regular campus program. Special sessions are self-supporting through fees collected from the participating students. Requests for application forms and information may be obtained from the Extended Education Office.

Summer sessions courses and workshops leading to various degrees and credentials are designed to meet the needs of regular or visiting students and others who wish to improve their professional competence.

Admission does not require completion of the matriculation process. Registration will not insure the privilege of enrollment in one of the regular quarters. Postbaccalaureate students should consult the *Graduate Studies Bulletin* regarding requirements for applicability of credit toward their degree objectives.

### INTERNATIONAL PROGRAMS

The California State University (CSU) International Programs offers students the opportunity to continue their studies overseas for a full academic year while they remain enrolled at their home CSU campus. The International Programs' primary purposes are to enable selected students to gain a firsthand understanding of other areas of the world and to advance their knowledge and skills within specific academic disciplines in pursuit of established degree objectives.

A wide variety of academic majors may be accommodated by the 25 foreign universities cooperating with the International Programs in 15 countries around the globe. The affiliated institutions are: the University of Sao Paulo (Brazil); the universities of the Province of Quebec (Canada); the University of Copenhagen, (through Denmark's International Student Committee's Study Division); the University of Provence (France); the Universities of Hamburg, Heidelberg, and Tübingen (Germany); the Hebrew University of Jerusalem (Israel); the University of Florence (Italy); Waseda University (Japan); the Iberoamericana University (Mexico); Massey University and Lincoln University College (New Zealand); the Catholic

## 56 Academic Requirements

University of Lima (Peru); National Chengchi University (Republic of China/Taiwan); the Universities of Granada and Madrid (Spain); the University of Uppsala (Sweden); and Bradford and Bristol Universities (the United Kingdom). Information on academic course offerings available at these locations is in the International Programs bulletin which may be obtained from the International Programs representative on campus.

Eligibility for application is limited to those students who will have upper division or graduate standing at a CSU campus by September 1985, who possess a cumulative grade point average of 2.75 for all college level work completed at the time of application (some programs require a 3.0 cumulative grade point average), and who will have completed required language study where applicable. Selection is competitive and is based on home campus recommendations and the applicant's academic record. Final selection is made by the Office of International Programs in consultation with a statewide faculty selection committee.

The International Programs supports all tuition and administrative costs overseas for each of its participants at the same extent that such funds would be expended to support similar costs in California. Students assume responsibility for all personal costs, such as transportation, room and board, and living expenses, as well as for home campus fees. Because they remain enrolled at their home CSU campus while studying overseas, International Programs students earn full resident credit for all academic work completed while abroad and remain eligible to receive any form of financial aid (other than work-study) for which they can individually qualify.

Information and application materials may be obtained from the International Programs Office, Dexter Building 211, or by writing to The California State University International Programs, 400 Golden Shore, Suite 300, Long Beach, California 90802. Applications for the 1985-86 academic year overseas must be submitted by February 1, 1985 (except for the New Zealand program where applications are due by May 15, 1984).





# ACADEMIC POLICIES

## ACADEMIC OBLIGATIONS

All students are expected to be diligent in the pursuit of their courses of study in order that both they and the State will receive maximum benefit from the educational opportunities provided.

Students are expected to satisfy the academic demands required by their instructors in such ways as they may set forth, in order to satisfy the instructor that they are performing their assignments in a proper manner.

Instructors are expected to give first priority to meeting their scheduled classes and other assigned responsibilities, including keeping regular office hours for student conferences.

An instructor, with the President's approval, may at any time exclude from a course any student guilty of unbecoming or disorderly conduct toward the instructor or the class. The instructor may refer the case of misconduct to the Dean of Students for disciplinary action.

## CENSUS DATE

The Census Date is defined to be the 15th academic day of each quarter. On this date, all transactions leading to the establishment of enrollment data for the quarter are finalized.

## CLASS ATTENDANCE

Students are expected to be regular in attendance to keep the quality and quantity of work high. Absence from classes is regarded as serious, and work missed is not excused.

An excused absence can be allowed only by the instructor in charge of the class upon consideration of the evidence justifying the absence presented by the student. An excused absence merely gives the individual who missed the class an opportunity to make up the work and is not an excuse from the work required.

## MAXIMUM LOADS

The maximum load for regular students is 20 quarter units of work including audited courses and concurrent work at other colleges; the only exceptions are made with the advance approval of the student's major department head and completion of a petition to carry excess load which is available in major departmental offices. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. Maximum load for graduate students is 16 units per quarter.

## SCHOLARSHIP REQUIREMENTS

Uniform standards for academic probation or disqualification, and for administrative-academic probation or disqualification, are in effect at all campuses of The California State University. Undergraduate students may be placed on academic probation and later be disqualified, or be placed on administrative-academic probation and later be disqualified, when they do not meet these standards.

Students who have been placed on academic probation, administrative-academic probation, or who have been notified of their disqualification may request review of such action by the dean of the school taking the action. Students who have been disqualified for inadequate progress or performance will not be readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission will be referred to the dean of the school in which the student wishes to enroll.

Students on academic probation may not participate on intercollegiate teams nor may they hold positions of leadership in student organizations or student government groups. This includes, but is not limited to, such groups as: athletic teams, debate teams, drama casts, judging teams, ASI councils, boards and committees. Such students may not hold an office in a student organization, nor may they be editors, managers, or hold similar positions on student publications. However, students on academic probation may participate in such activities as club membership, intramurals, and music which do not include travel and the official representation of the University.

Certain groups may have set higher standards than the minimum for specific positions or areas of responsibility that require considerable commitments of time and energy.

## ACADEMIC PROBATION OR DISQUALIFICATION

Both academic progress toward the degree objective and quality of academic performance are considered in the determination of a student's eligibility to remain enrolled. An undergraduate student becomes subject to academic probation or disqualification under the conditions shown below. For minimum scholarship standards applicable to graduate and postbaccalaureate students see the *Graduate Studies Bulletin*.

- I. Academic Probation: An undergraduate student is subject to academic probation if at any time his or her cumulative grade point average in all college work attempted or the student's Cal Poly cumulative grade point average falls below 2.0 (C) *or* if during any term while enrolled he or she fails to earn at least two times as many progress points as all units attempted. Students are notified of probationary status by a message on their grade report. An undergraduate student will be removed from academic probation when the student's cumulative grade point average in all college work attempted and the student's Cal Poly cumulative grade point average is 2.0 (C) or higher *and* when he or she earns at least twice as many progress points as all units attempted in a term.
- II. Academic Disqualification: An undergraduate student on academic probation *may* be disqualified when his or her cumulative grade point average for all college work attempted or his or her Cal Poly cumulative grade point average is 7 or more grade points below 2.0 (C), or, regardless of class level or cumulative grade point average, when in any term he or she fails to earn at least twice as many progress points as units attempted. Such a student on academic probation *shall* be subject to disqualification:
  - A. As a freshman or sophomore student (less than 90 quarter units of college credit completed) whose average falls 22½ or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.
  - B. As a junior student (90 to 134 quarter units of college credit completed) whose average falls 13½ or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.
  - C. As a senior student (135 or more quarter units of college credit completed) whose average falls 9 or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.

A student who is placed on probation or who is subject to disqualification at the end of an enrollment period will be notified by a message on the grade report which is issued following the end of the quarter in which the student's performance fails to meet the prescribed conditions. In cases where a student ordinarily would be disqualified at the end of a term save for the impossibility of making timely notification, the student may be advised that the disqualification is to be effective at the end of the next term.

## ADMINISTRATIVE-ACADEMIC PROBATION OR DISQUALIFICATION

An undergraduate or graduate student may be placed on administrative-academic probation by action of the dean of the school in which the student is enrolled for any of the following reasons:

- A. Withdrawal from all or a substantial portion of a program of studies in two successive terms or in any three terms.
- B. Repeated failure to progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.
- C. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students.

When such action is taken, written notice will be provided including a statement of the conditions for removal from probation and the circumstances which would lead to disqualification, should probation not be removed. If disqualified, the student will receive written notification from the dean of the school in which the student is enrolled including an explanation of the basis for the action.

## ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS

Eligibility for competition in intercollegiate athletics is regulated in general by the rules of the National Collegiate Athletic Association (NCAA), and specifically by current Conference and University regulations. The Director of Athletics is responsible for maintaining up-to-date intercollegiate athletics eligibility rules applicable to the University. The Faculty Athletic Representative has the responsibility for the interpretation of the NCAA, Conference, and University rules for determining student eligibility to represent the University in intercollegiate athletic events.

## GRADING SYSTEM

The following marking and grading system is in effect:

		Grade Points Earned Per Unit	Progress Points Earned per Unit
A	Superior Attainment of Course Objectives .....	4	4
B	Good Attainment of Course Objectives .....	3	3
C	Acceptable Attainment of Course Objectives .....	2	2
D*	Poor Attainment of Course Objectives.....	1	1
F	Non-Attainment of Course Objectives .....	0	0
CR	Credit .....	—	2
NC	No Credit .....	—	0
AU	Audit .....	—	—
I	Incomplete (authorized) .....	—	—
U	Incomplete (unauthorized) .....	0	0
SP	Satisfactory Progress.....	—	—
RD	Report Delayed .....	—	—
W	Withdrew.....	—	—

Final grades signifying student accomplishment are assigned for each course by the instructor. These grades are A,B,C,D,F,U,CR, and NC. A grade point average for each student is computed by dividing the total grade points earned by the total units in which the student received a grade of A,B,C,D,U, or F. Courses for which CR, NC, AU, I, RD, SP, or W were assigned are not included in the grade point computation.

Students are required to earn twice as many progress points as total units attempted each term in order to avoid being subject to probation. For this purpose courses with grades of CR and NC are included in addition to those with A,B,C,D, U and F.

## AUDIT

The "AU" symbol indicates that a student was officially enrolled in class, participated in class, but was not required to be examined on course materials. Enrollment as an Auditor is subject to the permission of the instructor. Procedures for auditing courses are published in the quarterly Class Schedule. Refer to "Auditing of Courses" section for additional information.

## INCOMPLETE (AUTHORIZED)

An incomplete signifies that a portion of required course work has not been completed and evaluated in the prescribed time period due to fully justified reasons and that there is still a possibility of earning credit. It is the student's responsibility to bring pertinent information to the instructor who will determine the means by which the remaining course requirements will be satisfied. A final grade is assigned when the work agreed upon has been completed and evaluated. The student is not permitted to reenroll in the course as a means to complete course requirements.

\* If a letter grade of "D" is received in a course which is a prerequisite for another course, the student is encouraged to repeat the prerequisite course before attempting the next course in sequence.

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An "I" must be made up within one calendar year immediately following the end of the term on which it was assigned. An instructor may specify a time limitation of less than one year. This limitation prevails whether or not the student maintains continuous enrollment. A student who cannot fulfill the course requirements within the prescribed time and who wishes to retake the course before the end of the time limitation should notify the instructor so their grade may be changed from "I" to "F". Failure to complete the assigned work will result in an "I" being counted as equivalent to an "F" (or an "NC") for grade point average and progress point computation.

### INCOMPLETE (UNAUTHORIZED)

The symbol "U" indicates that an enrolled student did not withdraw from the course but failed to complete course requirements. It is used when, in the opinion of the instructor, completed assignments or course activities or both were insufficient to make normal evaluation of academic performance possible. For purposes of grade point average and progress point computation this symbol is equivalent to an "F".

### SATISFACTORY PROGRESS

The "SP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress and has been evaluated and found to be satisfactory to date, but that assignment of a grade must await completion of additional work. Reenrollment is permitted prior to the assignment of the final grade provided that the total permissible number of units for the course or courses is not exceeded. Work is to be completed within a stipulated time period. This may not exceed one year except for graduate degree theses for which the time may be up to two years, but may not exceed the overall time limit for completion of all master's degree requirements. Any extension of time limit must receive prior authorization by the dean of the school in which the student is a degree candidate.

### CREDIT/NO CREDIT GRADING

Some courses, *as indicated in their catalog descriptions*, are offered on a Credit/No Credit grading basis only.

The following conditions apply when a student *elects* to take for Credit/No Credit grading those courses which are *not* designated by the University as being graded on an exclusive Credit/No Credit basis.

- a. Up to 2 courses (not to exceed 8 units) may be taken per student per quarter on a Credit/No Credit grading basis; a maximum total of 15 courses (not to exceed 45 units) may be elected per student for Credit/No Credit grading.
- b. The course may not be repeated as Credit/No Credit if the student has previously received a grade of "D", "U" or "F" in that course. The course may be repeated for Credit/No Credit only if the student has previously received a grade of "NC" in that course.
- c. Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must complete the appropriate form available from the Records Office. Such declaration for Credit/No Credit grading must be filed not later than the end of the third week of instruction of the quarter. Students may not change from one grading system to the other after the end of the third week of instruction of the quarter.
- d. Students will be given a grade of "Credit" for accomplishment equivalent to a grade of "C" or better. "No Credit" will be given for accomplishment equivalent to "D" or "F" grades. Instructors will submit conventional letter grades to the Registrar's Office where they will be converted to Credit/No Credit grades.
- e. Courses required for the student's major which are specified as either major or support courses in the student's major curriculum may not be taken for Credit/No Credit grading with the exception of those courses offered on a Credit/No Credit basis only, and those taken as Credit/No Credit under a previous major.
- f. The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work.
- g. Units earned in courses for which the grade was "Credit" will count toward satisfaction of degree requirements for undergraduate students only. No courses taken on a Credit/No Credit grading basis may be used to satisfy graduate program degree requirements.

- h. Grades of "Credit" or "No Credit" are not included in determining the student's grade point average.
- i. Nonmatriculated students in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of nonmatriculated students having no previous course work recorded at Cal Poly.)

### REPEATING A COURSE

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit or under the following policies:

1. A course taken at this or at another university or college in which a grade of "D", "F", "U" or "NC" was received may be repeated here with the new grade recorded along with the prior grade. The grade earned by repeating the course will be awarded the appropriate progress points, grade points and units attempted and completed.
2. Undergraduate students may repeat up to 20 units of "D", "F", or "U" and the original grade points and units will not be counted in the calculation of the grade point average. However, under the terms of this rule, a notice of intent to repeat a course must be filed in the Records Office prior to the end of the seventh week of instruction during the quarter in which the course is repeated.
3. Except where noted in the specific course description that the course may be repeated for credit, a student may not enroll in (except as an auditor) or receive credit by examination for any course in which a grade of "C" or higher, including "CR" has been received. A course may not be challenged by examination during the same quarter that the student is enrolled in the course.

### INVALIDATION OF PREVIOUS RECORDS

Under certain circumstances an undergraduate student may petition the University to remove from consideration associated with requirements for the baccalaureate degree up to two semesters or three quarters of undergraduate work taken at least five years previously at any college. Further information and petition forms are available from the Registrar.

### WITHDRAWALS FROM COURSES

The "W" symbol indicates that the student was permitted to drop the course after the regular drop period with the approval of the instructor and appropriate campus officials. It carries no adverse connotation of quality of student performance and is not used in calculating grade point average or progress points.

A student may withdraw from a class without academic penalty during the regular drop period which is defined as the end of the first meeting of the class in the second week of instruction of the quarter provided the instructor is formally notified. Between the end of the regular drop period for the class and the last day of instruction a student must request permission to withdraw from a course by processing a petition which is available at the Records Office. The petition will be approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the instructor and department head.

After the end of the 7th week of instruction withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In some such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw will be subject to failing grades (U or F).

### WITHDRAWAL FROM THE UNIVERSITY

A student is permitted to withdraw from the University upon request and without restriction or penalty until the end of the 7th week of the quarter. After the 7th week and through the last day of instruction, withdrawals from the University must be approved by campus officials. Disapproved, unauthorized, or unofficial withdrawal from the University will subject the student to failing grades in each course (U or F).

The student or duly authorized representative of the student is required to submit the request and reason for withdrawal in writing to the Registrar. The date of withdrawal will be established as the circumstances indicate or as determined by the Registrar.

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The student may be eligible for a full or partial refund of registration fees depending upon the time and circumstances of withdrawal from the University. A written application for refund is required. Specific limiting dates and application procedures are published in the quarterly class schedules.

### THE FAIRNESS BOARD

The Fairness Board is the campus group primarily concerned with providing "due process" for the students and instructors at the University, particularly in terms of student/faculty relationships. The Board hears grade appeals based on the grievant's belief that the instructor has made a mistake, shown bad faith or incompetence, or been unfair. However, the Fairness Board also may hear cases involving student/administration relationships. In all cases, the Board's authority is limited to actions consistent with other campus and system policies.

Details and procedures relating to the operation of the Fairness Board may be obtained from the *Campus Administrative Manual* located in departmental offices or from the Judicial Affairs Office.

### PROGRAM CHANGES

An official study list is prepared for each student who completes the formal registration process. All study lists are distributed by the student's major department and all changes to the official program become the responsibility of the student. Time periods have been established following registration during which students may attempt to add new courses or withdraw from existing courses. This regular add/drop (change of program) period is defined as the last day to add courses or the end of the second week of instruction, and the last day to withdraw from a class without petition, the end of the first meeting of the class in the second week of instruction. Specific dates for completing these transactions are published in the quarterly Class Schedule. The student must ensure that each instructor is properly notified before the expiration of the time limits and that the instructor formally acknowledges the change to the student's official program. A revised study list will be prepared for each student which will list the courses in which a final grade will be awarded.

Students registering late have one week to complete the late registration process and pay late registration fees. Courses may be added, units increased, and changes from credit to audit status can be made through the end of the second week of instruction. Each change requires that the student initiate contact with the instructor and present a valid registration receipt which verifies enrollment for the quarter in progress. Exceptions are made for late registrants who are required to have enrollment transactions completed at the end of the first week of instruction.

Students have until the end of the first meeting of the class in the second week of instruction to drop a class without petition and no entry on their academic record. At the first class meeting only, the instructor will delete a student's name from the official class list if the student is not present or has not been excused. It is the student's responsibility to notify the instructor whenever a class is being dropped and it should not be assumed that voluntary absence from class means automatic withdrawal. At the end of the regular add/drop (change of program) period the instructor must assume that any student who has not provided notification of withdrawal will remain officially enrolled in the course. For program changes after the end of the regular add/drop (change of program) period see WITHDRAWALS FROM COURSES.

A special provision, applicable only to students in their first quarter at the University, permits the substitution, without prejudice, of a prerequisite course in a sequence of courses for a later course in the sequence through the end of the fourth week. Only the substituted course appears on the transcript and the grade is based on performance after the change.

### CHANGES IN CURRICULUM

Students who find that they are preparing for a profession which does not provide the type of education for which they have the greatest aptitude should contact their adviser and the University Counseling Center for advice and assistance in making curriculum changes. Students will be permitted to apply for a change of major curriculum after six weeks in residence during which they follow the prescribed curriculum for their current major as far as possible. Admission to a new curriculum will depend on the availability of space within the limitations imposed by budget, faculty, and facilities.

Transfer from one curriculum to another does not in any way change a student's scholastic standing.

Transfer from a technical to a degree curriculum may be permitted subject to scholarship requirements and completion of the specified number of units in residence.

Upon transfer from a degree to a technical curriculum, at the campus, a student's record is evaluated in terms of the technical curriculum. Courses completed prior to transfer which are applicable to the required courses in the technical curriculum will be transferred intact. The remaining courses completed prior to transfer must apply as electives up to, but not in excess of, the number of elective units specified in the technical curriculum. In the case of an excess of elective units, the student may choose which units shall apply. For purposes of computing the grade point average for graduation, only those courses transferred as outlined above and those taken subsequent to transfer will be used.

### REVISION OF CURRICULAR REQUIREMENTS

A student remaining on *continuous attendance* in regular sessions and continuing in the same curriculum in any state university or college, in any of the California community colleges or in any combination of California community colleges and state university and colleges, may, for purposes of meeting graduation requirements, elect to meet the graduation requirements in effect either at the time of entering the curriculum or at the time of graduation therefrom, except that substitutions for discontinued courses may be authorized or required by the student's school dean.

### CURRICULUM SUBSTITUTION

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. Detailed instructions for applying for a curriculum substitution may be obtained from the Records Office.

### HOLDING OF RECORDS

Student records may be placed in a "Hold" status because of financial or other obligations to the University. The "Hold" status authorizes the University to withhold the permission to register, release of transcripts, and other services normally provided to the student. The student's records will be held until the obligation is cleared to the satisfaction of the office or department placing the "Hold."

### GRADUATE COURSES TAKEN BY UNDERGRADUATES

Undergraduates are not permitted to take courses in the 400 or 500 series for graduate credit until they are within 12 quarter units of graduation. Such students may petition for up to 9 units of graduate credit when the courses are not required for the baccalaureate degree and must petition for the credit prior to completion of the course work. Students should verify the applicability of such credit toward their graduate objective.

### TRANSFER TO OTHER COLLEGES

Students who plan to transfer from California Polytechnic State University to another college or university should, at the earliest possible date, request that their transcript of academic record be forwarded by the Records Office. Any evaluation of transcripts presented to another college or university will be made by the new institution in terms of its established policies.

### PRIVACY RIGHTS OF STUDENTS IN EDUCATION RECORDS

The federal Family Educational Rights and Privacy Act of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (45 C.F.R. 99) and California *Education Code* Section 67100 et seq., set out requirements designed to protect the privacy of students concerning their records maintained by the campus. Specifically, the statute and regulations govern access to student records maintained by the campus, and the release of such records. In brief, the law provides that the campus must provide students access to records directly related to the student and an opportunity for a hearing to challenge such records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under the law does

not include any right to challenge the appropriateness of a grade as determined by the instructor. The law generally requires that written consent of the student be received before releasing personally identifiable data about the student from records to other than a specified list of exceptions. The institution has adopted a set of policies and procedures concerning implementation of the statutes and the regulations on the campus. Copies of these policies and procedures may be obtained at the Judicial Affairs Office. Among the types of information included in the campus statement of policies and procedures are: 1) the types of student records and the information contained therein; 2) the official responsible for the maintenance of each type of record; 3) the location of access lists which indicate persons requesting or receiving information from the record; 4) policies for reviewing and expunging records; 5) the access rights of students; 6) the procedures for challenging the content of student records; 7) the cost which will be charged for reproducing copies of records; and 8) the right of the student to file a complaint with the Department of Education. An office and review board have been established by the Department to investigate and adjudicate violations and complaints. The office designated for this purpose is: The Family Educational Rights and Privacy Act Office (FERPA), U.S. Department of Education, 330 "C" Street, Room 4511, Washington, D.C. 20202.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" includes the student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. The above designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying information which the student requests not be released. Written objections should be sent to the Director, Judicial Affairs.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons are those who have responsibilities in connection with the campus' academic, administrative or service functions and who have reason for using student records connected with their campus or other related academic responsibilities.

### USE OF SOCIAL SECURITY NUMBER

Applicants are required to include their Social Security account number in designated places on applications for admission pursuant to the authority contained in Title 5, *California Administrative Code*, Section 41201. The Social Security account number is used as a means of identifying records pertaining to the student as well as identifying the student for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution.

### HONORS

Candidates for bachelor's degrees with an overall grade point average falling within the top ten percent of the students graduating from each school shall be those students awarded "Honors at Graduation."

The three Honors categories are as follows:

Summa cum laude—the top 1%

Magna cum laude—the next 3%

Cum laude—the next 6%

Honors at Graduation is officially calculated at the time the graduate has *completed* graduation requirements.

The "President's Honors List" is compiled at the end of each college year to honor those undergraduate students who have demonstrated consistent achievement, as represented by being named to the "Dean's Honors List" for any three of the four quarters of the college year.

The "Dean's Honors List" is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more letter-graded units during the quarter with a grade point average which places them in the top 15 percent of the students in their school.



## STUDENT CONDUCT AND DISCIPLINE

It is expected that all California Polytechnic State University students are enrolled for serious educational pursuits and that they will conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from it at any time that they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority which includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher education.

While enrolled, students are subject to the regulations governing discipline stated in *Education Code* Section 66017 and in Title 5 of the *California Administrative Code*, Sections 41301-41304, and to such rules and regulations as have been approved and promulgated by authority of the President. Copies of Title 5 *Cal Adm Code* 41301 and 41302, which deal specifically with student disciplinary regulations, are available to all students through the "Campus Rules" section printed in the Class Schedule for each quarter and are posted officially in the Administration Building. Other applicable regulations are contained in this Catalog, in the *Campus Administrative Manual*, and in other official University publications.

## STUDENT DISCIPLINARY PROCEDURES

The Chancellor of The California State University has established procedures for student disciplinary matters which are included in the Campus Administrative Manual, the official campus publication of policies and procedures which is available in the library for easy reference.

Educating students to their responsibilities as good citizens of the University and of the community is a campus-wide responsibility requiring the cooperation and understanding of the entire campus. Title 5 of the *California Administrative Code* assigns to the President responsibility for enforcement of student disciplinary regulations. The President has delegated to the Director of Judicial Affairs the responsibility and commensurate authority to administer student disciplinary regulations and has delegated decision-making authority on cases which proceed to a hearing at the local campus level to the Dean of Students.

When the conduct or behavior of a student is such that there is an alleged violation of applicable provisions of the *Education Code*, regulations of the Board of Trustees, and campus rules and orders issued thereunder, the case is referred to the Director of Judicial Affairs for investigation of the facts leading to the allegation. If the investigation reveals that there is reason to believe that an infraction has been committed by a student, disciplinary procedures as described in the *Campus Administrative Manual* will be initiated.

## ELIGIBILITY FOR STUDENT ACTIVITIES

Students on either academic or disciplinary probation may not participate on intercollegiate teams nor may they hold positions of leadership in chartered student organizations or coded student government groups. Students on probation may participate in such student organizations and groups as members but they may not hold an office or represent the University or the Associated Students, Incorporated, in any official capacity.

## STUDENT INVOLVEMENT IN DISCIPLINARY PROCEDURES

Student Hearing Boards conduct hearings in the residence halls and make recommendations to the Director of Judicial Affairs. In addition, students have majority representation on the Student Appeals and Advisory Commission which also includes members of the faculty and of the administrative staff; this group makes recommendations to the President in appropriate cases.

## PROCEDURAL DUE PROCESS

In all matters of student discipline, each person charged with a violation is given every courtesy, privilege, and right under the law and within the context of the uniqueness of a public institution of higher learning.

## STUDENT DISCIPLINE

Inappropriate conduct by students or by applicants for admission is subject to discipline as provided in Sections 41301 through 41304 of Title 5, *California Administrative Code*. These sections are as follows:

Article 1.1, Title 5, *California Administrative Code*

41301. **Expulsion, Suspension and Probation of Students.** Following procedures consonant with due process established pursuant to Section 41304, any student of a campus may be expelled, suspended or placed on probation or given a lesser sanction for one or more of the following causes which must be campus related:

- (a) Cheating or plagiarism in connection with an academic program at a campus.
- (b) Forgery, alteration or misuse of campus documents, records, or identification or of knowingly furnishing false information to a campus.
- (c) Misrepresentation of oneself or of an organization to be an agent of a campus.
- (d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.
- (e) Physical abuse on or off campus property of the person or property of any member of the campus community or of members of his or her family or the threat of such physical abuse.
- (f) Theft, of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.
- (g) Unauthorized entry into, unauthorized use of, or misuse of campus property.
- (h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.
- (i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a campus function without prior authorization of the campus president.
- (j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.
- (k) Abusive behavior directed toward, or hazing of, a member of the campus community.
- (l) Violation of any order of a campus president, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.
- (m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.

(n) For purposes of this Article, the following terms are defined:

(1) The term "member of the campus community" is defined as meaning California State University and Colleges Trustees, academic, non-academic and administrative personnel, students, and other persons while such other persons are on campus property or at a campus function.

(2) The term "campus property" includes:

(A) real or personal property in the possession of, or under the control of, the Board of Trustees of the California State University and Colleges, and

(B) all campus feeding, retail, or residence facilities whether operated by a campus or by a campus auxiliary organization.

(3) The term "deadly weapons" includes any instrument or weapon of the kind commonly known as a blackjack, sling shot, billy, sandclub, sandbag, metal knuckles, any dirk, dagger, switchblade knife, pistol, revolver, or any other firearm, any knife having a blade longer than five inches, any razor with an unguarded blade, and any metal pipe or bar used or intended to be used as a club.

(4) The term "behavior" includes conduct and expression.

(5) The term "hazing" means any method of initiation into a student organization or any pastime or amusement engaged in with regard to such an organization which causes, or is likely to cause, bodily danger, or physical or emotional harm, to any member or the campus community; but the term "hazing" does not include customary athletic events or other similar contests or competitions.

(o) This Section is not adopted pursuant to *Education Code* Section 89031.

(p) Notwithstanding any amendment or repeal pursuant to the resolution by which any provision of this Article is amended, all acts and omissions occurring prior to that effective date shall be subject to the provisions of this Article as in effect immediately prior to such effective date.

41302. **Disposition of Fees: Campus Emergency; Interim Suspension.** The President of the campus may place on probation, suspend, or expel a student for one or more of the causes enumerated in Section 41301. No fees or tuition paid by or for such student for the semester, quarter, or summer session in which he or she is suspended or expelled shall be refunded. If the student is readmitted before the close of the semester, quarter, or summer session in which he or she is suspended, no additional tuition or fees shall be required of the student on account of the suspension.

During periods of campus emergency, as determined by the President of the individual campus, the President may, after consultation with the Chancellor, place into immediate effect any emergency regulations, procedures, and other measures deemed necessary or appropriate to meet the emergency, safeguard persons and property, and maintain educational activities.

The President may immediately impose an interim suspension in all cases in which there is reasonable cause to believe that such an immediate suspension is required in order to protect lives or property and to insure the maintenance of order. A student so placed on interim suspension shall be given prompt notice of charges and the opportunity for a hearing within 10 days of the imposition of interim suspension. During the period of interim suspension, the student shall not, without prior written permission of the President or designated representative, enter any campus of the California State University and Colleges other than to attend the hearing. Violation of any condition of interim suspension shall be grounds for expulsion.

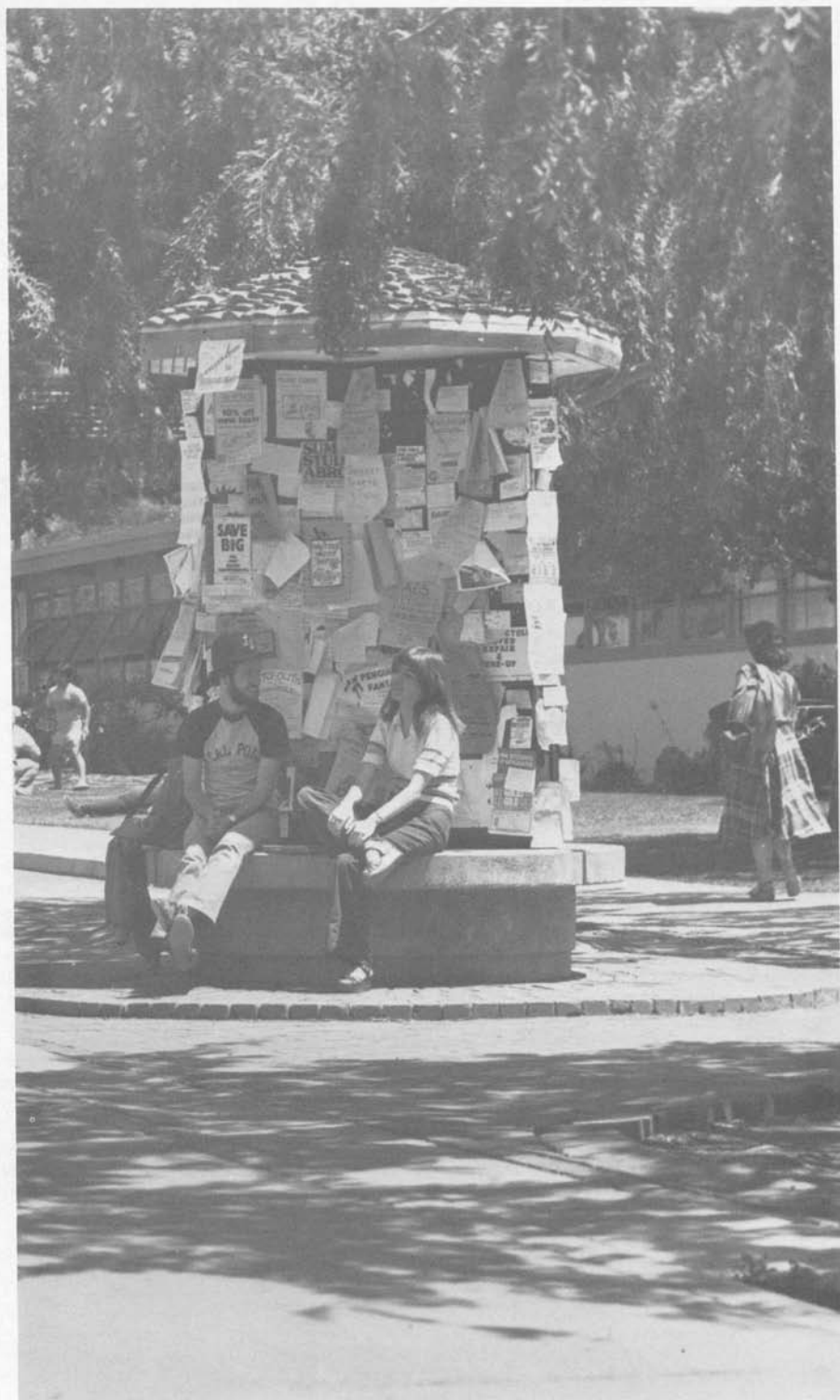
41303. **Conduct by Applicants for Admission.** Notwithstanding any provision in this Chapter 1 to the contrary, admission or readmission may be qualified or denied to any person who, while not enrolled as a student, commits acts which, were he enrolled as a student, would be the basis for disciplinary proceedings pursuant to Sections 41301 or 41302. Admission or readmission may be qualified or denied to any person who, while a student, commits acts which are subject to disciplinary action pursuant to Section 41301 or Section 41302. Qualified admission or denial of admission in such cases shall be determined under procedures adopted pursuant to Section 41304.

41304. **Student Disciplinary Procedures for the California State University and Colleges.** The Chancellor shall prescribe, and may from time to time revise, a code of student disciplinary procedures for the California State University and Colleges. Subject to other applicable law, this code shall provide for determinations of fact and sanctions to be applied for conduct which is a ground of discipline under Sections 41301 or 41302, and for qualified admission or denial of admission under Section 41303; the authority of the campus President in such matters; conduct related determinations on financial aid eligibility and termination; alternative kinds of proceedings, including proceedings conducted by a Hearing Officer; time limitations; notice; conduct of hearings, including provisions governing evidence, a record, and review; and such other related matters as may be appropriate. The Chancellor shall report to the Board his actions taken under this section.

Among the specific causes for which the University will take such disciplinary action are: the bringing or drinking of alcoholic beverages on campus; being intoxicated on campus; repeated violations of campus rules and regulations, including those pertaining to driving and parking of vehicles.

In accordance with provisions of Section 41301 above, the President has issued and posted officially an order which prohibits the consumption, possession, or use of alcoholic beverages on campus. Students who violate this order are subject to the penalties provided for in Sections 41301 and 41302, Title 5 of the *California Administrative Code*.

Disciplinary action varies with the severity of the violation. If the unacceptable behavior involves use of motor vehicles, the student may be restricted from driving or parking on campus. If the unacceptable behavior involves matters pertaining to on-campus housing or dining, the student may be restricted from living or dining on campus.



## Student Activities and Services

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## STUDENT ACTIVITIES

The campus provides an integrated program of classroom and laboratory instruction, and cocurricular activities. A professional staff in the Activities Planning Center is responsible for coordinating a wide spectrum of meaningful activities for all students. Leadership development workshops, conferences, and classes are offered to increase the effectiveness and efficiency of current officers in student organizations and government. These programs are located in the Activities Planning Center of the University Union, a student-financed facility.

### STUDENT GOVERNMENT

All students are members of the student association, known as the Associated Students, Inc., California Polytechnic State University, San Luis Obispo. The government by student officers is vested in the Student Senate, the members of which are elected according to regulations established in the Associated Students, Inc. bylaws. In addition, there are a number of sponsored student programs including Week of Welcome, Poly Royal Board, Cultural Advisory Committee, Rose Parade Float Committee, Music Board of Control, ASI Program Board, Rodeo Team, etc. All interested students have an opportunity to participate in student government.

#### Associated Students, Inc./University Union Business Affairs

The Julian A. McPhee University Union provides services, conveniences, and amenities for the University community and promotes a forum for informal association, interaction, and dialogue. The Union offers a variety of recreational entertainment and information facilities as well as eating outlets, conference rooms, and a comfortable area to meet friends or just to relax. Primarily concerned with extending the educational experience through the promotion of "nonacademic" activities, the Union provides many services which include the Information Desk, Galerie, Games Area, Craft Center, Second Edition (Copy Center), Escape Route, Ticket Office, Intramurals, and more. The creation and maintenance of such an environment is the mission of the Associated Students, Inc./University Union Business Office.

### MULTI-CULTURAL CENTER

The Multi-Cultural Center, located in the University Union, seeks to increase students' cultural awareness and sensitivity by providing reading and research materials, workshops, information on cultural programs and events, and coordinating the activities of ethnic clubs and organizations.

### ATHLETICS

Intercollegiate competition is held under the rules and auspices of the National Collegiate Athletic Association. Conference competition is maintained in most sports as a member of the California Collegiate Athletic Association. Intercollegiate competition is offered for men in the sports of football, basketball, wrestling, baseball, track, swimming, cross country, soccer, and tennis. Women's sports are conducted in volleyball, track, basketball, cross country, gymnastics, tennis, softball, and swimming. For eligibility rules see ELIGIBILITY FOR INTER-COLLEGIATE ATHLETICS.

### INTRAMURALS AND CAMPUS RECREATION

The Activities Planning Center offers an intramural program which provides opportunities for all students to participate in a variety of individual, dual, and team sports, many of which are coeducational. The objectives of the intramural program are to provide education in physical skills, recreation, social contact, carry-over activities, and physical fitness through the give-and-take of competition.

### CAMPUS ORGANIZATIONS

Over 300 clubs and organizations cover all departments and activities, and the opportunity exists for every student to take an active part in club life. There are departmental and professional organizations, hobby-interest clubs and many others serving the areas of honor societies, service clubs, residence groups, ethnic groups, and religious faith groups.

### MEDIA

Publications of the student body at California Polytechnic State University, San Luis Obispo, are not only written and edited by students, but are also printed on campus as laboratory work for students majoring in Graphic Communications. Editorial and photographic work for publications is handled primarily by students of the journalism classes. *Mustang Daily* is the official newspaper of the Associated Students, Inc. In addition, the Journalism Department operates KCPR-FM, a student station heard on campus and in the surrounding community.

### STUDENT COMMUNITY SERVICES

A comprehensive program of student volunteer assistance to people who need help, both on and off campus, is coordinated in the Disabled Student Services Office in the University Union. Services include such things as tutoring, recreation, and helping the handicapped of all ages.

### POLY ROYAL

Each year during the last full weekend in April Cal Poly holds an open house exhibition and show conducted primarily by the Associated Students. This event is known as Poly Royal. Its purpose is to display work accomplished during the year by students. Each department on the campus prepares displays that reflect the curriculum within that department and its relation to employment, as well as the activities and success of the graduates. Besides the shows and exhibits there are many entertainment features such as intercollegiate baseball, swimming, and rodeo. Other special events include music department concerts, dramatic presentations, aquacade, carnival, various judging contests, and a mathematics contest featuring students from high schools throughout the State.

## STUDENT AFFAIRS AND SERVICES

Cal Poly provides a number of programs and services designed to assist students to gain the most from their college experience. Some of the services are directed toward group activities, others toward helping students on an individual basis.

Programs and services aid students in overcoming difficulties, while supporting and encouraging intellectual and personal development.

### ACADEMIC ADVISORY SYSTEM

The educational program places great emphasis on the counseling and advising of all students. The Cal Poly Student Advisory System has five objectives:

- 1) to assist students in planning and programming a course of study;
- 2) to assist students to develop to the full extent of their academic ability;
- 3) to monitor the students' progress toward their vocational objective, referring them to the appropriate offices when necessary;
- 4) to establish a personal relationship so that the student has a friend to whom to turn for advice;
- 5) to provide an active follow-up check on the students' progress in their academic work.

### COUNSELING SERVICES

The Counseling Center offers assistance and growth experiences for a wide variety of student needs and environmental improvement. Services include counseling, career development, learning assistance, testing, and program consultation. In addition to receiving help in time of crisis, students can develop skills in such areas as communication; problem solving; career planning; decision making; study habits and techniques; and ability, interest, or personality assessment.

Faculty and staff can consult with the Center for help with such areas as group communication, organizational and group processes, career education, learning styles, test construction and other skills which will improve the learning environment for students. Counseling, Career

## 72 Student Affairs and Services

Development, Testing, and Consultation Services are located in Jespersen Hall, next to Mustang Stadium. The Learning Assistance Center is located in Chase Hall.

### STUDENT ACADEMIC SERVICES

Student Academic Services incorporates the offices of the Educational Opportunity Program, Disabled Student Services, Minority Engineering Program, Student Affirmative Action, and Upward Bound. It is a multifaceted, educational support and enhancement program. This program is intended to insure access, academic success and graduation for students from backgrounds that have traditionally been underrepresented within the California State University System.

Services include early outreach; on-site orientation; curriculum advisement; specialized study skills and orientation courses; tutorial services; study facilities; on-campus transportation; special parking permits; loan of adaptive equipment and provision of direct services (readers, notetakers, tutors); faculty and peer mentoring; counseling; campus referrals; career planning; graduate school placement; learning, comprehension and composition skill seminars and classes.

### FOOD SERVICE

Food Service on campus is operated by the Cal Poly Foundation. A variety of menus and dining areas is offered to satisfy the varied needs and interests of students. Four campus dining facilities provide cafeteria service for meal plan and cash customers. For quick snacks, Food Service also operates, on a cash basis, a Burger Bar, Ice Cream Parlour, the Campus Store, and vending areas. In addition, Vista Grande Restaurant offers full sit-down service for formal occasions, visits with parents, and special celebrations.

### MEAL PROGRAMS

In addition to a la carte and vending services, meal ticket plans are available from the Foundation Business Office. See page 74 for meal plan requirement for resident students.

### FRATERNITIES AND SORORITIES

Eight national fraternities, seven national sororities, and three local fraternities have chapters at Cal Poly. The fraternities are: Alpha Epsilon Pi, Alpha Gamma Rho, Alpha Phi Alpha, Alpha Sigma, Alpha Upsilon, Delta Sigma Phi, Delta Tau, Lambda Chi Alpha, Phi Kappa Psi, Sigma Alpha Epsilon, and Theta Chi. The sororities are: Alpha Chi Omega, Alpha Kappa Alpha, Alpha Phi, Gamma Phi Beta, Kappa Delta, Sigma Kappa, and Zeta Tau Alpha.

Most of the fraternities and sororities own or lease buildings near the Cal Poly campus. Some fraternities provide lodging and meals for their members and pledges; the sororities house approximately fifteen members each. Students interested in seeking affiliation with a sorority or fraternity should contact the Coordinator for Greek Affairs at the Activities Planning Center.

### HEALTH SERVICES

The primary mission of the Cal Poly Health Center is to support the students' progress toward a diploma and to promote a positive outcome in the students' personal development. Minimizing time loss from illness and injury is helped by the well-qualified staff and excellent facilities, but increasing emphasis is on prevention of injury and illness. Health education promotes positive changes in life style for lifelong benefits. The Health Center provides outpatient services and an inpatient infirmary.

The health program is financed by the student through three plans; for complete coverage, each student is encouraged to participate in all three.

1. All students are entitled to Basic Outpatient Services. Prepayment for these services is included in Student Services Fees paid at registration. Outpatient care is offered Monday through Friday, year round, 8:00 a.m. to 5:00 p.m. and includes: physician and nursing services, specialty clinics, clinical laboratory and x-ray services. There is no charge for these services beyond Student Service Fees.

2. An optional Health Card fee entitles the student to services in the campus infirmary and 24-hour emergency care by Health Center nurses and physicians. Additional services under the Health Card plan are preventive oral health, allergy shots, athletic medicine, ambulance



subsidy, and physical examinations required by the University, employers, Peace Corps, etc. All of these services are provided at no extra charge to students with a Health Card. The services also are available to students without a Health Card on a fee-for-service basis. However, these Health Card services are not available during summer quarter.

3. Medical/surgical care received off campus is at the students' expense. For major medical/surgical problems which the Health Center cannot treat, each student is encouraged to be covered for major medical/surgical and emergency expenses through a supplemental major medical and hospital insurance policy, e.g., Blue Cross/Blue Shield, Kaiser, etc. A policy written specifically for Cal Poly students is available through a private company.

## HOUSING SERVICES

### Cal Poly's Residence Halls

Cal Poly offers on-campus housing accommodations to approximately 2800 students annually. In addition to the convenience which living in one of the many diversified residential hall facilities naturally affords, the program component sponsored throughout the housing system is designed to be a comprehensive and meaningful adjunct to the student's total University experience. Utilizing a philosophic premise of "challenge and support," residence hall staff coordinate a multifaceted approach toward this aspect of student life to allow for a merging of academic assistance and personal growth.

The respective living groups are each monitored by a full-time professional resident director who serves as the staff coordinator. The resident directors provide assistance in counseling, crisis intervention, general referral, judicial concerns, and student advising as well as supervising the department's team of student resident advisers.

Student representatives are elected to serve on governing bodies of the area halls in the fall term of each year. Participants in this student leadership development forum assist in the total development of their hall's community, plan social, recreational and educational offerings, and voice student concerns to affiliated areas of the University community.

Academic assistance is underscored through academic support programs of in-hall tutors, study groups and learning assistance workshops are provided throughout the living units.

New students who wish to live in the residence halls should request on-campus housing by returning their housing application to the Admissions Office. This is found in the "Notice of Space Reservation" booklet. Housing licenses are mailed to students according to a priority system which generally provides first priority to returning students with hardship situations and high priority to new students. Priority for housing is as follows:

1. Returning students who have resided in campus housing for only one quarter, that being the prior spring quarter.
2. Returning students designated as hardship cases by the Director of Housing as follows:
  - a. physically handicapped
  - b. close relatives, e.g., a brother who has a younger brother coming to campus
  - c. economic situations verified by Financial Aid
  - d. educational reasons verified by academic departments
3. New undergraduate students
4. Returning students by class level as follows:
  - a. prior year freshmen
  - b. prior year sophomores
  - c. prior year others
 (Class level will be determined by units completed.)

5. If there are vacancies after the above students have been accommodated, all other students under 30 years of age will be offered housing. Students who are 30 years of age or older must be granted special permission by the Director of Housing.

Signed licenses, accompanied by the required payment, must be returned by the deadline stated in the license. Failure to comply with the license stipulations may result in loss of housing assignment.

## LIVING EXPENSES FOR STUDENTS LIVING IN CAMPUS RESIDENCE HALLS

(Subject to Change)

### Room and Board

Room (academic year) annual license required (double occupancy) .... \$1,450.00–1,700.00  
 Board, annual (mandatory) (academic year) ..... 1,367.00  
 Housing security deposit (payable prior to occupancy) ..... 20.00  
 Room payable in advance. Arrangements to pay in installments may be made upon application for campus housing. A service fee of \$4.00 per quarter shall be charged for the right to make installment payments.

Students furnish their own bed spreads and study lamps.

Two meal ticket plans are available. On-campus residence hall students must choose one of these two plans. The 19-meal plan provides a maximum of 19 meals per week at a cost of \$1,507.00 prepaid for the academic year. The 14-meal plan provides for a maximum of 14 meals per week at a cost of \$1,367.00 prepaid for the academic year. Meal plan payments may be made in three installments for an additional service charge of \$6 per installment. Students may change from one meal plan to another if written notification is given prior to an installment due date to be effective the following academic quarter.

### Community Housing

The Community Housing Office maintains a listing service of vacant houses, apartments, mobile homes, and an extensive list of private and shared rooms. These listings are for San Luis Obispo and the north and south county areas. Included in the listings is information on rental rates, number of bedrooms, utilities included, location, person to contact, phone number, and any other special features. New listings are posted, rented ones removed, and others modified as soon as the information is made available to the office. The University does not inspect, approve, or disapprove any units offered for rent. The staff assists students with information about where and how to look for housing, things they should know about contracts, deposits, and general information about the community and university.

### PLACEMENT SERVICES

A centralized placement service is available to all students and alumni of the University. The Placement Center and instructional departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience. Placement Center services focus on the following student-centered objectives: to assist students in determining objectives and subsequent goals; to explore the full range of employment possibilities; and to present the student or graduate effectively as a candidate for employment. To this end, a full complement of programs and services are available through the Student Employment and Career Placement sections of the Placement Center.

### Student Employment

On-campus and off-campus part-time and summer employment opportunities are available to students through the Student Employment section of the Placement Center. These opportunities as well as specialized job seeking skills workshops are available on a first-come, first-served basis throughout the year. In addition to the walk-in, self-selection service, a special effort is made to place students in career-related part-time and/or summer employment through the Work Experience and Summer Employment programs. Job information and listings from throughout California and the Western United States are available to students along with a limited number of on-campus interviews. Because of the developmental impact this service has on a student's future career direction, students are encouraged to participate as early in their college experience as possible.

### Career Placement

Every prospective graduate of the University should register with the Placement Center no later than the first quarter of the senior year. Teaching credential candidates should register with the Placement Center at least one quarter prior to the initial student teaching assignment.

Through workshops and individual advisement, students are guided through the development and implementation of a job search strategy that includes clarifying the job objective, how to identify, research and contact potential employers, preparation of the resume and Educational Placement File, and several employment interview training opportunities. Employer contacts are developed for students on an individual basis, however, a very popular and heavily utilized on-campus interview program is also available. Students also are encouraged to take advantage of the Employer Resource Library which contains a variety of career opportunity brochures, annual reports on the placement of graduates, a summary of job listings by major, current salary offer information, as well as occupational trend reports.

### RELATIONS WITH SCHOOLS

The Relations with Schools Office provides information about the university and its academic programs to educators, counselors, prospective applicants and their parents. It serves as a central point for inquiries received about the educational programs and requirements of the university. Staff are available to visit high schools and community colleges with information and materials on the instructional offerings. Anyone wishing to visit the campus should contact this office at (805) 546-2792 for appointments.

## FINANCIAL AID

The University has a variety of loan funds, scholarships, awards, and part-time employment opportunities designed to assist students financially. Students who must have assistance in order to complete their college work should read this section carefully. Additional current information may be obtained by writing to the Financial Aid Office for a copy of *Financial Aids Announcement*.

The application for Financial Aid is called the Student Aid Application for California (SAAC). It may be obtained from any university or college financial aid office or any California high school. Scholarship applications must be requested directly from the Financial Aid Office.

The deadline for filing the Student Aid Application for California (SAAC) to College Scholarship Service (CSS) is March 1. Applicants must send the appropriate filing fee along with the SAAC to College Scholarship Service, Box 70, Berkeley, CA 94701.

### TYPICAL STUDENT EXPENSES

Following is an estimate of typical expenses per quarter for the average California resident student living in campus residence halls. Nonresident students should be prepared to pay tuition and fees. For the 1983-84 school year nonresident tuition was \$72 per unit. Charges for room and board are payable in advance or in installments.

(All State fees are subject to change upon approval by the Board of Trustees of The California State University.)

State University fee .....	\$134.00
Associated Student fee .....	14.00
University Union fee .....	14.00
Health fee—optional (per quarter) .....	27.00
Student services fee (per quarter) .....	70.00
Facilities fee .....	2.00
Instructionally Related Activities Fee .....	5.00
Room and board with mandatory annual 19-meal ticket .....	994.00
Books and supplies (estimated) .....	100.00†
Personal expenses and transportation .....	357.00
Estimated total per quarter (approximately 3 months) .....	\$1,717.00

† Beginning engineering and architecture students should be prepared to pay up to \$170 in their first quarter.

## UNIVERSITY SCHOLARSHIPS

## General Information

Over 600 scholarships a year are awarded or confirmed by the California Polytechnic State University Scholarship Committee. Applications that are received by the Financial Aid Office are transmitted to the Scholarship Committee, where each is reviewed in terms of the student's financial need, scholastic ability, participation in school and community affairs, and interest in chosen major. Some Cal Poly scholarships have certain requirements regarding field of study, area of residence, year in school, and project or design portfolios.

Generally, a student must have at least an over-all grade point average of 3.0 to be granted a scholarship award. There are some scholarships, however, which are given to students with lower grade point averages who meet certain criteria of need, a specific field of study, or other special qualifications. *If you are in doubt about your eligibility or have not received word on your admission status to Cal Poly, be sure to apply by the filing deadline.*

## How to Apply

**ANNUAL DEADLINE DATE:** March 1 for the following academic year

The California Polytechnic State University Scholarship Application (available in January from the Financial Aid Office) should be filled out completely. Two reference forms are included as part of the application and each one should be completed by an individual who can attest to the student's ability to profit from a college education, need for financial assistance, leadership abilities, and interest and participation in school activities. A Student Aid Application for California (SAAC) is also required and should be submitted to the College Scholarship Service (designating Cal Poly to receive a copy) well in advance of the filing date, to insure ample time for processing.

## Scholarship Notifications

Typically, the California Polytechnic State University Scholarship Committee meets in April to confirm scholarship awards. During the months of May and early June, scholarship award letters will be forwarded to the recipients. The student will be informed of the scholarship amount, how it will be disbursed during the school year, and of the requirement for maintaining full-time enrollment status while receiving the scholarship. According to the donors' specifications, recipients of the Hessellund, Turner, VanDyke and Wrasse Scholarships will be required to verify that they have earned between \$300 and \$375 for the previous year.

As scholarships are awarded for an academic year and disbursed in increments for Fall, Winter, and Spring (with an exception for Architectural Scholarships), the award will be prorated accordingly should graduation during mid-year or withdrawal from school occur.

Unfortunately, there are not enough funds to be awarded to all students who apply for the Cal Poly scholarships. Students not selected will be so notified, with the possibility of being placed on an alternate list. Occasionally scholarship recipients cannot accept their awards and the Scholarship Committee will then choose an alternate student, according to their ranking order, as a replacement.

## ALAN PATTEE SCHOLARSHIPS

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, are not charged fees or tuition of any kind at any California State University campus, according to the Alan Pattee Scholarship Act, *Education Code* Section 68121. Students qualifying for these benefits are known as Alan Pattee scholars. For further information contact the Admissions/Registrar's Office, which determines eligibility.

## GENERAL SCHOLARSHIPS

R. W. Andrews Scholarships  
 Lulu Grumbles Bumphrey Scholarships  
 California Polytechnic State University  
 Memorial Scholarships  
 California Polytechnic State University  
 Women's Club Scholarship  
 California Rural Rehabilitation Scholarships  
 Felix Camacho-Betteravia Farms  
 Scholarships  
 Chinese Association Scholarships

Herbert E. Collins Scholarships  
 Bing Crosby Youth Fund Scholarship  
 Green and Gold Barbecue Scholarship  
 Regnar Hesselund Scholarships  
 Julian A. McPhee Award  
 Helen V. Sandercock Scholarships  
 William and Adelaide Sandercock  
 Scholarships  
 William B. Turner Scholarships  
 J. Van Dyke Memorial Scholarships

## AGRICULTURE AND NATURAL RESOURCES

Catherine C. Adams Scholarships  
 Barling Memorial Scholarships  
 Paul Belveal Memorial Forestry  
 Scholarships  
 L. L. Bennion Scholarship  
 Danny Bettencourt Memorial Scholarships  
 California Agri-Fair Scholarships  
 California Association of  
 Nurserymen-Peninsula  
 Chapter Scholarship  
 California Cowbelles Scholarship  
 California Dairy Industries Association  
 Scholarship  
 California State Grange Scholarships  
 Earl J. Cecil Educational Foundation  
 Scholarships  
 Claire Davis Clark Scholarship  
 Continental Grain Scholarships  
 Agnese Davey Scholarship  
 Wellington Davey Scholarship  
 Dr. Arnold Dean Scholarship  
 General Dillingham Produce Industry  
 Scholarships  
 Dorothy Bancroft Drasel-Redwood Empire  
 Chapter Scholarship  
 Kenneth H. Easter Scholarship  
 Environmental Industries, Inc., Scholarship  
 Paul Etchechury Memorial Scholarship  
 J. Corder Gibson Scholarship  
 Ray Hansen Memorial Scholarship  
 William Randolph Hearst Foundation  
 Scholarships  
 William (Ben) and Helen Holman Alumni  
 Scholarship

International Agriculture Fellowships  
 Robert Matthew Kies Scholarships  
 Kings River Prune and Apricot Scholarships  
 Knudsen Foundation Scholarship  
 E. C. Loomis and Son Scholarship  
 Los Angeles County Fair Association  
 Scholarship  
 Lucky Stores Scholarships  
 James F. Merson Memorial Scholarship  
 Stevan H. Mueller Scholarship  
 Dan Nikkel Memorial Scholarship  
 Harry Parker Memorial Scholarship  
 Roland Pautz Scholarship  
 Pi Alpha Xi-Howard C. Brown Scholarship  
 Poultrymen's Cooperative Association  
 Scholarship  
 Rain for Rent, Inc. Irrigation Scholarship  
 in Memory of Paul Etchechury  
 Rancho Santa Fe Garden Club Scholarship  
 Dante Righetti Scholarships  
 Rodeo Club Scholarships  
 Harry Rosedale Memorial  
 (Monrovia Nursery) Scholarship  
 San Luis Obispo Lions Club/  
 Food Industries Scholarship  
 Santa Barbara County Horticulture Society  
 Scholarship  
 Harmon Toone Scholarship  
 Eric C. Twist Memorial Scholarship  
 Western Growers Association Scholarship  
 Leopold Edward Wrasse Scholarships

# ARCHITECTURE AND ENVIRONMENTAL DESIGN

Stephen O. Anderson Memorial Scholarship  
Wallace W. Arendt Scholarship  
Bechtel Affirmative Action Award  
Bechtel Corporation Scholarships  
California Portland Cement Company  
Scholarship  
Environmental Industries, Inc., Scholarship  
Golden Eagle Award  
Allan C. Johnson Scholarship  
Kawasaki/Theilacker Scholarship  
D. Stewart Kerr Scholarships  
Landscape Architectural Scholarship Funds  
Alice C. Loh Competition Award

Warren Ludvigsen Memorial Scholarship  
David Martin Scholarship  
Julia Morgan/Phoebe Hearst Architecture  
Scholarships  
John Muir Scholarship  
Primiani-Weaver Scholarship  
Professional Architects Scholarship  
Rain Bird Sales, Inc., Scholarships  
Jay Jay Shapiro Scholarship  
Edward Thompson Memorial Scholarship  
Wong-Brocchini Scholarships  
Frederick Peter Young Scholarships

# BUSINESS

Arthur Andersen and Company  
Scholarships  
H. S. Crocker Company-  
Roland Meyer Memorial  
Scholarship  
Ernst and Whinney Scholarship  
Frank and Norma Exter Scholarship

Charles Wyndham Flanagan Scholarship  
Getty Oil Scholarships  
Jeffrey W. Land Scholarship  
Peat, Marwick, Mitchell Scholarship  
Price Waterhouse Scholarship  
Larry Ratner Scholarship

# COMMUNICATIVE ARTS AND HUMANITIES

H. S. Crocker Company—Roland Meyer  
Memorial Scholarship  
NAPP Systems Scholarships

Michael O'Leary Scholarship  
Willard "Pete" Pederson Scholarship

# ENGINEERING AND TECHNOLOGY

Alcoa Foundation Scholarships  
American Institute of Aeronautics and  
Astronautics Scholarships,  
Vandenberg Section  
American Microsystems, Inc., Assistantships  
American Society of Heating, Refrigeration  
and Air-Conditioning Engineers Scholar-  
ships (ASHRAE)  
—Sacramento Chapter  
—San Jose Chapter  
—Southern California Chapter  
Arthur Andersen and Company Scholarship  
Bechtel Corporation Scholarships  
Boeing Company Scholarships  
California PTA Scholarship  
Chevron USA Inc.—Standard Oil Company  
Scholarship  
Comm-Air Energy Conservation  
Scholarship  
Allan R. Davis Scholarship  
Fluid Power Educational Foundation  
Scholarship

Fluor Engineering Scholarship—Southern  
California Division  
FMC Corporation Scholarship  
Harold R. Frank—Applied Magnetics  
Corporation Scholarships  
Getty Oil Company Scholarships  
Glenn A. Hubbard Memorial Scholarship  
—Experimental Aircraft Association  
Industrial Technology Society Scholarships  
Kiewit Pacific Company Scholarship—  
Arcadia Branch  
Peter Kiewit Sons' Company Scholarship—  
Omaha Branch  
Elgin Knott Memorial Scholarships  
Manville Fund, Inc., Scholarships  
Charles S. Osborne, Jr., Scholarship  
Frank E. Pilling, Sr., Scholarship  
Roy N. Poage Memorial Scholarship  
Raytheon Company Scholarships  
Schlage Lock Company Scholarships  
Society of Manufacturing Engineers—  
Student Chapter Scholarships

## HUMAN DEVELOPMENT AND EDUCATION

California PTA Scholarships  
 California Retired Teachers Association—  
   Laura E. Settle Scholarship  
 Child Development Scholarship  
 Edward Ernatt—Special  
   Education Scholarship

Elizabeth Hanlon Parks Memorial  
   Scholarship  
 Morro Bay Womens' Club Scholarship  
 Larry Ratner Scholarship  
 Mildred Shepard Scholarship

## SCIENCE AND MATHEMATICS

Arthur Andersen and Company—Kappa Mu  
   Epsilon Scholarship  
 Applegarth Biology Scholarships  
 Beta Beta Beta Biological Society  
   Scholarships  
 Biological Sciences Scholarships  
 Chevron, USA, Inc.—Standard Oil  
   Company Scholarship  
 Dr. Clyde P. Fisher Memorial Scholarship  
 Hatfield Memorial Scholarship  
 Robert E. Holmquist Memorial Scholarship  
 John David Jackman Memorial Award  
 W. Boyd Judd Scholarship

E.H. "Woody" Lehman Memorial—  
   Natural History Scholarship  
 Barbara Lee Lincoln Memorial Award  
 Marine Biology Award  
 Margaret McCormack Memorial Scholarship  
 Mu Delta Phi Scholarship  
 Sierra Vista Hospital Volunteers Auxiliary  
   Scholarship  
 Mary E. Smith Memorial Marine Biology  
   Award  
 Harold J. Watson Memorial Scholarship

## ATHLETICS

Robert A. Mott Scholarship

Musselman Wrestling Scholarships

## OTHER SCHOLARSHIPS

In addition to the scholarships awarded by the University, many awards from various private donors and organizations are available to assist students in meeting University expenses. Interested students should make inquiries for such awards directly to the sponsoring organization.

## LOANS

Loans are for educational purposes only, with definite provisions for repayment. There are four types: National Direct Student Loan, California Loans to Assist Students, Guaranteed Student Loans, and Cal Poly Long-Term Emergency Loans. Also available are emergency loans of small amounts, interest free, over a short-term period.

### National Direct Student Loan (NDSL)

The National Direct Student Loan can provide up to \$3,000 per year with a maximum of \$6,000 aggregate to undergraduate students. Loans also are available to graduate students. The NDSL is a five percent interest per year loan that begins six months after the student leaves school or ceases to be at least a one-half time student. The government pays the interest while the student is in school and during the six-month grace period. There are a few cancellation provisions for students who teach in a Head Start program or who teach the handicapped. The application for this loan is the SAAC which must be submitted to CSS by March 1 for the upcoming school year.

### California Loans to Assist Students (CLAS)

This program enables parent and student borrowers to obtain loans for educational costs through banks and other lending institutions. A CLAS loan goes into repayment 60 days after the loan is made. Parents and less than full-time student borrowers must pay the interest and principal. Full-time student borrowers begin interest-only payments and may defer principal repayment until a change in enrollment status. CLAS loan interest is currently at 12 percent. To apply, contact your local lending institution or the Financial Aid Office.

## 80 Financial Aid

### Guaranteed Student Loans (GSL)

This program enables students to borrow funds from banks and other lending institutions. Loans are processed by the University and approved by a cooperating lending agency. The GSL is an eight percent interest loan. The federal government will pay the interest on the principal borrowed while the student is in school. Upon entering the repayment period, the student will assume the interest obligation at eight percent per year on the unpaid balance. Deadlines vary according to the lending agency as do maximum amounts loaned.

### University Emergency Student Loans

University emergency student loan funds are available to provide temporary assistance to eligible students. Loans from these funds are made for varying periods of time and amounts, according to the regulations and conditions prescribed in the establishment of the particular loan fund. The following types of loans may be made by obtaining applications from the Financial Aid Office:

*University Long-Term Emergency Loans* are granted to students who demonstrate a long-term educational need. They are approved by a standing loan committee on the basis of written applications, recommendations, and interviews. Promissory notes signed by the borrower and a cosigner are required. A four to six percent interest is charged on the unpaid balance after the specified due date, graduation, or withdrawal from the University as agreed upon by the borrower. A one percent service charge is deducted from the loan disbursement.

*University Short-Term Emergency Loans* are granted for unexpected emergency situations. A maximum of \$200 may be borrowed during an academic year. Repayment is due either in January or June depending on when the loan was received. A one percent service charge is deducted from the loan disbursement and 12 percent interest is charged on the unpaid balance.

University Emergency Student Loans include donations received from the following:

Agricultural Engineering Loan Fund  
Alumni Loan Fund  
American Society of Heating, and Air  
Conditioning Loan Fund  
American Welding Society Loan Fund  
Lamar Anderson Memorial Loan Fund  
Student Architect Wives' Club Loan  
Fund  
Marie Van Aspersen Memorial Loan Fund  
Bachino Loan Fund  
Baer-Beck Loan Fund  
Edgar E. Bilodeau Loan Fund  
Jed S. Blake Memorial Loan Fund  
CFFA/Agricultural Education Loan Fund  
California Association of Agriculture  
Laboratories Loan Fund  
California Association of Resource  
Conservation Districts Loan Fund  
California Polytechnic State University  
Women's Club Fund  
California Retired Teachers' Association  
Loan Fund  
W. B. Camp Loan Fund  
C.A.R.S.E.S. Loan Fund  
Logan S. Carter Loan Fund  
Margaret Chase Memorial Loan Fund  
Herbert E. Collins Loan Fund  
Thomas J. Comer Memorial Loan Fund  
Cooperative Education Loan Fund  
Harlan Diedrichsen Memorial Loan Fund  
Esther Biaggini Dugan Loan Fund  
Environmental Protection Agency Loan  
Fund

1960 Football Team Memorial Loan Fund  
Independent Order of Foresters Loan Fund  
Anita M. Hathaway Loan Fund  
John Holley Memorial Loan Fund  
Ralph Hoover Loan Fund  
Horsehoeing and Animal Husbandry Loan  
Fund  
Impact Publishers Loan Fund  
International Students Loan Fund  
Chris Jespersen Loan Fund  
Fred Kimball Loan Fund  
William Kirkpatrick Memorial Loan Fund  
Alfred M. Kretzmann, Jr., Memorial Loan  
Fund  
Lee Gird Levering Memorial Loan Fund  
Lynn T. Lobaugh Memorial Loan Fund  
Metal Heat Treating Association of  
California Loan Fund  
Music Club Memorial Loan Fund  
Nissen Educational Loan Fund  
Ornamental Horticulture Loan Fund  
Janet Penfold Memorial Loan Fund  
Rotary Loan Fund  
San Fernando Valley Club of Printing  
House Craftsmen Loan Fund  
George Schlmeier Memorial Loan Fund  
Sears Roebuck Loan Fund  
Norma Sullivan Memorial Loan Fund  
*Telegram-Tribune* Loan Fund  
Todd Farm Loan Fund



## GRANTS

### Pell Grant

This is a Federal aid program designed to provide financial assistance to undergraduates who need it to attend post-high school education institutions. The amount a student is eligible for depends on their Student Aid Index, full-time or part-time status, and the cost of education. If a student is applying for other aid through the SAAC, they can apply for the Pell grant at the same time. However, students applying for a *Pell only* must complete the Application for Federal Student Aid.

### Supplemental Educational Opportunity Grant Program

This grant-in-aid program is intended to assist undergraduate students who, without substantial aid such as this, could not attend college. Applicants must submit a Student Aid Application for California to the College Scholarship Service by March 1 for the upcoming school year.

### College Work-Study Program

Work-Study is a federally funded program which provides employment for students who are in need of financial assistance in order to complete their education. Jobs can be located on campus as well as at off-campus approved agencies. It is intended that work-study jobs not only assist the student financially but also provide pertinent work experience. Rates of pay vary depending on the job requirements and the student's skills. To apply, complete the SAAC and submit to CSS by March 1 for eligibility consideration for the upcoming school year.

## STATE AID TO THE PHYSICALLY HANDICAPPED

The State of California, through its Bureau of Vocational Rehabilitation, provides financial assistance to students who have physical disabilities. This assistance equals the necessary school expense and may include an additional amount to help cover the cost of living. Students who may be entitled to the assistance should apply to the State Bureau of Vocational Rehabilitation.



# School of Agriculture and Natural Resources

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# SCHOOL OF AGRICULTURE AND NATURAL RESOURCES

Lark P. Carter, Dean  
Larry P. Rathbun, Associate Dean  
John W. West, Associate Dean

The School of Agriculture and Natural Resources prepares students in the field of agriculture with the main objective of giving them a broad and full understanding of basic factors involved in production, management, processing, distribution, marketing, sales, and services in related businesses to make efficient operators and managers. While the school stresses production techniques and basic management to benefit those returning to the farm or entering employment in other agricultural fields, it also requires a core of basic science courses related to the major and general education courses.

This preparation also provides the sound basis necessary for the student desiring to become a teacher of agriculture in California's secondary schools and community colleges.

Curricula in the School of Agriculture and Natural Resources are arranged so that the student receives a maximum of production courses in the major field early in the program. The student who terminates formal education prior to graduation thus acquires some knowledge and experience. In addition, the student is able to determine in a short time whether or not the curriculum selected is appropriate to his or her skills and interests.

Furthermore, the early acquisition by the student of practical, "doing" types of activities provides an incentive to learn basic scientific explanations.

The courses offered in each agricultural curriculum may be grouped into four areas as follows:

1. Major agriculture—The required sequence of courses offered by the department in which the student expects to graduate. These courses constitute the core of specific preparation for the major field.
2. Related agriculture—Supporting courses in agriculture selected from closely allied fields. They supplement the major agriculture block.
3. Science and mathematics—Courses selected from scientific fields which provide basic biological, physical, social science, and mathematical background and support for the agricultural blocks above.
4. Humanistic and social—Courses which provide cultural background for intelligent participation in a complex world society.

## RECOMMENDED PREPARATION

Admission to the School of Agriculture and Natural Resources requires high school graduation, with appropriate grades and aptitude test scores. A student who anticipates enrolling in an agricultural major will find a strong background in mathematics and physical and biological sciences to be advantageous.

## PROGRAMS

Curricula are offered in the following majors in the School of Agriculture and Natural Resources: agricultural engineering, agricultural management, agricultural science, animal science, crop science, dairy science, food science, fruit science, mechanized agriculture, natural resources management, ornamental horticulture, poultry industry, and soil science.

The Agricultural Education Department provides an additional program of courses required of prospective secondary agriculture teachers.

The Animal and Veterinary Science Department offers veterinary science courses supportive of the animal science and dairy science majors. It also offers a 12-week course in horseshoeing in the fall and spring quarters.

## GRADUATE PROGRAMS

The School of Agriculture and Natural Resources offers a program of study leading to the Master of Science degree with a thesis or nonthesis option. The Master of Science degree, thesis option, is an academic degree which provides graduate level scholarly activities and research, and serves as a preparation for those careers which require knowledge of the science of agriculture beyond the bachelor's level.

The Master of Science degree, nonthesis option, is a professional degree designed primarily to enhance the competencies of agricultural educators.

### MASTER OF SCIENCE-THESIS OPTION

Specializations within the thesis option include: International Agricultural Development, Mechanized Agriculture, and Soil Science. Each specialization requires the successful completion of a thesis based upon independent supervised research. Students should contact their individual department to determine the availability of funding for their research.

Students in all specializations must pass the graduation writing requirement as outlined under the nonthesis option and will be required to have completed at least one course in statistical methods and/or experimental design. All students will be required to pass both a written and an oral comprehensive examination.

### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE WITH A SPECIALIZATION IN INTERNATIONAL AGRICULTURE DEVELOPMENT

(For University requirements see the *Graduate Studies Bulletin*)

	<i>Units</i>
Required courses .....	35
AM 435, AM 510, AM 515, AM 516, POLS 510, AG 599 (6 units) and courses approved by the school's graduate studies committee	
Global Concentrations .....	6
Select 1 area of concentration (specified courses or courses approved by the School's Graduate Studies Committee):	
Africa-POLS 468	
Latin America	
Asia-POLS 417	
Electives .....	6
Electives may be selected from any 500-level course approved by the student's graduate committee bearing the prefixes AE, AG, AGED, AM, CRSC, FRSC, OH, PI, SS, VGSC, VS	
	47

### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE WITH A SPECIALIZATION IN MECHANIZED AGRICULTURE

(For University requirements see the *Graduate Studies Bulletin*)

	<i>Units</i>
Required courses .....	21
AE 521, AE 522, AE 533, AE 581, AG 599 (9 units)	
Restricted electives .....	18
At least 9 units must be in computer related course work; remaining units must be selected from: CRSC 521, NRM 502, SS 521, VGSC 521, or other courses approved by the School's Graduate Studies Committee. At least 3 units must be at the 500 level.	
Electives .....	6
As approved by the student's graduate committee	
	45

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE WITH A SPECIALIZATION IN SOIL SCIENCE

(For University requirements see the *Graduate Studies Bulletin*)

Prerequisite: A B.S. degree in Soil Science, related field or physical or biological sciences, or a B.A. degree with proficiency in the basic sciences (chemistry, physics, botany, biology, and statistics).

	<i>Units</i>
Required courses .....	24
AG 599 (6 units), NRM 502, SS 508 or SS 522, SS 581, SS 582, any 400- and 500-level computer science or applied computer science course (3 units)	
Electives <sup>1</sup> .....	21
400- and 500-level courses approved by the student's graduate committee. At least 6 units of electives must be from outside of the School of Agriculture and Natural Resources.	
	45

### MASTER OF SCIENCE—NONTHESIS OPTION

Students enrolled in the Master of Science degree, nonthesis option, will be required to complete one year of successful teaching or graduate level internship prior to the final examination. Students must pass the graduation writing test with a grade of 10 or better, or pass ENGL 302 or ENGL 318 with a grade of B or better during their first quarter in residence. ENGL 302 or ENGL 318 may not be used to satisfy elective course requirements within the Master of Science program. All students will be required to pass both a written and an oral comprehensive examination.

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE GENERAL AGRICULTURE—NONTHESIS OPTION

	<i>Units</i>
Required courses .....	12
AG 539, AGED 520, AGED 522	
Restricted electives .....	27
Any approved 400- and 500-level agriculture courses. At least 9 units must be selected from AE 521, AE 522, CRSC 521, NRM 502, SS 521, VGSC 521, or any 581 course with an agriculture prefix. At least 9 additional units must be at the 500 level.	
Electives .....	6
Any 400- and 500-level course approved by the student's graduate committee	
	45

### AGRIBUSINESS SPECIALIZATION IN THE MBA PROGRAM

The School of Business and the Agricultural Management Department jointly offer an Agribusiness Specialization in the Master of Business Administration program. The program is part of the two-year MBA curriculum and requires the completion of six graduate classes taught by the Agricultural Management Department. Information and application materials may be obtained by writing to the MBA Coordinator, School of Business.

<sup>1</sup> A minimum of 23 units in 500-level courses is required for completion of the graduate program.

## TECHNICAL CURRICULA IN AGRICULTURE

In keeping with the Universitywide policy of offering major courses which lead to occupational competency from the beginning of the first year of the four-year sequence, it is essential to provide opportunity for students who may find it impossible to complete four-year programs to obtain as early as possible a concentration of production courses with a minimum of supporting material.

A technical two-year curriculum is available in each of the following agriculture areas: animal science, crop science, dairy husbandry and manufacturing, food science, fruit science, ornamental horticulture, and poultry industry. These curricula include a smaller number of units of related and general education and breadth courses than are included in the degree programs. This permits the student to acquire the basic fundamentals in the major and a greater freedom of choice of subjects in agricultural production courses. A student not wishing to enroll in a degree curriculum will find that a two-year curriculum offers a maximum opportunity to select courses which will apply directly to an agricultural career.

Upon completion of 98 required units, a student may receive a technical certificate in the major field.

A student enrolled in the technical program will not be allowed to enroll for credit in any 300- or 400-series courses except when prior approval has been obtained by petition for special consideration.

The following is the two-year technical curriculum for animal science. Other majors follow a similar pattern. Detailed curriculum information is available from the dean of the school and the department heads.

A student enrolled in the technical program may not transfer to a degree program except by following the approved university procedure for such transfers.

Students will be required to take two of the four elementary species courses and the corresponding two applied management courses.

Freshman	F	W	S
ASCI 202 Feeds and Feeding .....		3	
ASCI 240 Applied Feeds and Feeding .....		2	
ASCI 111 Market Beef Production .....	3		
ASCI 112 Elements of Swine Production .....		3	
ASCI 113 Elements of Sheep Production .....			3
ASCI 114 Elements of Horse Production .....	3		
AE 121/AE 122 Agricultural Mechanics .....		2	
Agricultural Engineering elective .....			2
English composition course .....	3		
MATH 102 Agricultural Mathematics .....	3		
<sup>1</sup> BIO 099 Agricultural Biology .....		3	
SS 121 Soils .....			4
<sup>2</sup> Electives .....	5	4	8
	17	17	17
Sophomore			
ASCI 241 Applied Beef Cattle Practices .....	2		
ASCI 242 Applied Swine Management Practices .....		2	
ASCI 243 Applied Sheep Management Practices .....			2
ASCI 244 Applied Horse Practices .....	2		
Agricultural Engineering electives .....	4		
<sup>1</sup> VS 099 Principles of Veterinary Science .....		5	
CRSC 123 Forage Crops .....			4
<sup>1</sup> AM 099 Farm Records .....	4		
<sup>1</sup> POLS 210 American and California Government .....		3	
Agricultural Management electives .....	3		
<sup>2</sup> Electives .....	1	6	9
	16	16	15

<sup>1</sup> These courses are taken in place of the required courses in the same subject matter fields listed in the degree curricula in the first two years and may not be used as credit toward a degree. VS 099 is replaced by CRSC 099 for plant majors.

<sup>2</sup> 11 units of 100-200 level ASCI, DH, DM, FDSC, PI, or VS courses must be included.

## AGRICULTURAL ENTERPRISE PROJECT FACILITIES

The School of Agriculture and Natural Resources utilizes the student enterprise program of the California Polytechnic State University Foundation to provide practical experience which supplements the regular production courses. This enterprise program leads to a fuller understanding of important production and managerial problems in agriculture.

The entire farm with its equipment, buildings, and livestock is available to students for their use in conducting a wide variety of agricultural enterprise projects.

The University Foundation has some of the best breeding flocks and herds of livestock in the State. In addition to the 150 registered Hereford, Angus and Shorthorn beef cattle, there is a 200-cow commercial beef herd which provides experience in typical range cattle management. All necessary equipment for beef cattle production—barns, dehorning and loading chutes, corrals, stock horses, etc.—is available.

The Foundation swine herd consists of two major breeds—Yorkshires and Hampshires. The facilities include a 10-unit farrowing house and outside lots and pastures for the brood sows. In addition there are 12 feeder units for student projects having a capacity of approximately 20 market hogs per unit. Student projects market between 400 and 500 market hogs each year.

The Foundation breeding flock of sheep is made up of two breeds—Hampshire and Suffolk. From 20 to 40 breeding ewes are maintained in each of the breeds, giving the students an opportunity of carrying on typical purebred breeding operations. Opportunities are offered for work with a typical commercial sheep flock of 300 ewes. Students also have the opportunity of learning shearing and care of wool as well as lamb production.

The dairy herd includes purebred Jerseys, Guernseys, and Holsteins. Equipment includes all the necessary facilities for feeding and milking, care of calves and bulls, artificial insemination, milk testing, bottling, separating, and creamery operations. Students conducting dairy projects carry out their operations on a separate grade A dairy.

The poultry flock consists of between 10,000 and 12,000 birds. The equipment includes a modern incubator, egg-handling facilities, brooders and brooder houses, pens for trap-nesting and pedigree work. Students care for all operations under the supervision of the technicians.

The Ornamental Horticulture Department occupies a unit consisting of fifteen greenhouses and six shade houses together with a sales unit and two large labs used for nursery instruction. Student projects are operated in all phases of nursery work. Equipment includes all of the essential machinery necessary for operation of a modern unit.

The Crop Science Department is well equipped with all types of machinery found on mechanized farms in California. All of the farming operations are carried on by the students under the supervision of the Crop Science Department through project class work or paid student labor. Orchards, vineyards, crop land, fruit and vegetable packing facilities and marketing outlets are available for instructional purposes.

The Agricultural Engineering Department operating and servicing all of the mechanized equipment on the campus provides many opportunities for students to learn practical farm machinery maintenance and repair. The major part of the maintenance work is handled by students under faculty supervision.



## AGRICULTURAL EDUCATION DEPARTMENT

Department Head (Interim), Joseph E. Sabol

Glen R. Casey

Robert A. Flores

William C. Kellog

The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduates and graduate students.

Students interested in teaching agriculture may receive a Bachelor of Science degree in any of the agricultural science production or management fields. Course work toward the teaching credential should be started early in order to complete the total curriculum most effectively.

An Agricultural Science major has been developed which includes a credential preparation program providing for early field experience and undergraduate student teaching. Graduates with a degree in Agricultural Science obtain a concentration of preparation in Agricultural Mechanics, Agricultural Products and Processing, Agricultural Resources Management, Agricultural Supplies and Services, Animal Production, Ornamental Horticulture, or Plant Production.

Student teaching may also become a part of the graduate program for agriculture majors. Candidates have five years in which to complete 45 quarter units of postgraduate course work necessary for the "clear" teaching credential, after receiving the preliminary teaching credential.

Agricultural education courses may be used to fulfill up to twenty-four of the forty-five units required for the Master of Science degree with a specialization in General Agriculture. Detailed information may be obtained in the office of the Dean of the School of Agriculture and Natural Resources.

### CURRICULAR CONCENTRATIONS

#### **Agricultural Mechanics**

A selection of courses designed to develop knowledge and ability necessary to perform agricultural mechanical operations and processes.

#### **Agricultural Products and Processing**

A selection of courses concerned with the principles and practices involved in the science and technology of agricultural products.

#### **Agricultural Resources Management**

A selection of courses stressing the principles and practices involved in the conservation, multiple use or improvement of natural resources.

#### **Agricultural Supplies and Services**

A selection of courses which stresses providing the consumable supplies and services needed in the production phase of agriculture.

#### **Animal Production**

A selection of courses stressing principles and practices related to the economic use of resources in the production of livestock and poultry.

#### **Ornamental Horticulture**

A selection of courses stressing the principles and practices involved with the culture of plants used for ornamental or aesthetic purposes.

#### **Plant Production**

A selection of courses stressing principles and practices related to the economic use of resources in the culture and production of agricultural plants.

## 90 Agricultural Education

### CURRICULUM IN AGRICULTURAL SCIENCE

Freshman	F	W	S
ASCI 230 General Animal Science .....	4		
DH 230 General Dairy Husbandry .....			4
CRSC 230 General Field Crops and/or FRSC 230 California Fruit Growing and/or VGSC 230 General Vegetable Crops .....	4	4	
AE 121/AE 122 Agricultural Mechanics .....		2	
AE 141 Agricultural Tractors and Equipment Skills .....			3
AGED 202 Introduction to Agricultural Education .....	2		
BOT 121 General Botany (B.1.b.) .....		4	
ZOO 131 General Zoology (B.1.b.) .....			4
MATH 114 College Algebra (B.2.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
Agriculture courses to complete major .....		7	4
	17	17	15
Sophomore			
SS 121 Soils .....	4		
AM 201 Agricultural Business Sales and Service .....	3		
OH 230 Ornamental Gardening .....		3	
PI 230 General Poultry Production .....	3		
ETWT 144 Manufacturing Processes .....			2
AE 340 Irrigation Water Management .....			4
AGED 303 F.F.A. Programs and Activities .....		2	
AGED 339 Supervised Agricultural Experiences .....			2
CHEM 121 General Chemistry (B.1.a.) .....	4		
PSY 201 General Psychology (E.1.) .....			3
ECON 201 Survey of Economics (D.3.) .....		3	
SPC 202 Principles of Speech (A.3.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....	3		
Electives and courses to complete major .....		5	5
	17	16	16
Junior			
AM 301 Agricultural Marketing .....		3	
AM 321 Farm Records .....			4
ED 305 Teaching and Learning Processes .....	3		
ED 302 Multicultural Education in the Secondary School .....	3		
POLS 210 American and California Government (D.1.) .....			3
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
CSC 110 Computers and Computing or AM 250 Computer Application to Agriculture (F.1.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....	4		
SOC 105 Introduction to Sociology (D.4.) .....		3	
Agriculture courses to complete major .....	4	5	3
	17	17	17

	F	W	S
Senior			
AGED 461, AGED 462 Senior Project .....	2	2	
AGED 438 Instructional Processes in Agricultural Education .....	3		
ED 405 Diagnosis, Prescription and Evaluation .....	2		
AGED 441 Student Teaching Practicum or			
AGED 463 Undergraduate Seminar .....		2	
ED 404 Field Experience in Secondary School Reading .....	3		
ED 403 Reading Methods in the Secondary School .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
SPAN 101 Elementary Spanish (C.3.) .....		5	
PE 250 Health Education (E.2.) .....			2
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
ECON 325 Underdevelopment and Economic Growth (D.4.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (300-400 Level) (C.3.) .....			3
Agriculture courses to complete major .....	4	2	4
	17	17	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Agricultural Education and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)



## AGRICULTURAL ENGINEERING DEPARTMENT

Department Head, Edgar J. Carnegie

James Bermann  
George M. Brown III  
Charles M. Burt  
Larry J. Glass  
Robin R. Grinnell

Lloyd H. Lamouria  
Willard H. Loper  
Glenn W. Salo  
Rollin D. Strohman  
Rodger E. Vierra

Robert E. Walker  
James P. Webster, Jr.  
Douglas W. Williams  
James B. Zetsche, Jr.

The Agricultural Engineering Department offers two programs leading to a Bachelor of Science degree: Agricultural Engineering and Mechanized Agriculture.

Department facilities include well-equipped laboratories for hydraulic systems, evaluation and testing of power units, fabrication of agricultural machinery, agricultural electrical systems, design and construction of agricultural structures, photogrammetry, microcomputers and controllers.

Outdoor facilities include a field for evaluation of irrigation systems and land for experience in the production of farm products and operation of agricultural machinery.

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is composed of Mechanized Agriculture and Agricultural Engineering majors and is involved in a broad range of activities and services including Homecoming, the tractor pull team, and Poly Royal displays. The student branch of the American Society of Agricultural Engineers offers an active program of professional and extracurricular activity.

### AGRICULTURAL ENGINEERING MAJOR

Agricultural engineers provide the engineering necessary for the development of agriculture. The agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources and water resources and designing structural units. The curriculum features a unique combination of engineering and agricultural course work designed to prepare the graduate to assume a productive role in society.

Employment opportunities exist primarily in the design, evaluation and management of systems encompassing irrigation, drainage, hydrology, soil conservation; farm machinery; food processing; and agricultural environments. Manufacturers, consulting engineers, and governmental and private agencies are the primary employers.

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

### MECHANIZED AGRICULTURE MAJOR

This major gives the student broad agricultural training with emphasis on the applied mechanical phases of agriculture. Business and management courses also are emphasized. Nine units of electives enable the student to tailor his or her degree program in mechanized agriculture toward those emphasis areas which suit his or her career objectives. Emphasis areas include business, agricultural management, crop science, animal science, or industrial technology and irrigation system management.

Career opportunities are available in sales and service of farm equipment and machinery, fabrication and design of agricultural equipment, teaching vocational agriculture with an emphasis on agricultural mechanics, and management of machinery systems for a farm or ranch.

### CURRICULUM IN AGRICULTURAL ENGINEERING

Freshman		*F	W	S
AE 128	Agricultural Mechanics .....	3		
AE 143	Power and Machinery .....		4	
AE 237	Engineering Surveying .....			2
ETME 141	Applied Descriptive Geometry .....		2	
ETME 142	Engineering Drawing Systems .....			1
ETMP 144	Manufacturing Processes: Machining I .....	2		
ETWT 144	Manufacturing Processes .....			2

	F	W	S
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SS 121 Soils .....	4		
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....		4	4
<sup>1</sup> Critical reading elective (C.1.) .....			3
	17	17	16
<b>Sophomore</b>			
AE 232 Agricultural Structures Planning .....			3
AE 236 Principles of Irrigation .....	4		
ETME 143 Engineering Drawing Systems .....	1		
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....			3
ENGR 251 Digital Computer Applications (F.1.) .....		2	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
ME 211, ME 212 Engineering Mechanics .....		3	4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
Elective .....			3
	16	17	17
<b>Junior</b>			
AE 312 Hydraulics .....	4		
AE 315 Hydrology .....		3	
AE 326 Off-the-Road Locomotion .....		3	
AE 331 Irrigation Theory .....		3	
AE 333 Engineering Properties of Agricultural Materials .....			3
AE 338 Computer Interfacing and Measurements .....			3
EE 201 Electrical Circuit Theory .....	3		
EE 261 Electric Circuits Laboratory .....	1		
ME 302 Thermodynamics .....	3		
CE 204, CE 205, CE 206 Strength of Materials and Laboratory .....		3	3
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
POLS 210 American and California Government (D.1.) .....			3
STAT 321 Statistical Analysis .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (300 level) (C.3.) .....			3
	18	15	18
<b>Senior</b>			
AE 403 Agricultural Systems Engineering .....			3
AE 414 Irrigation Engineering .....			4
AE 421, AE 422 Equipment Engineering .....	4	3	
AE 433 Agricultural Structures Design .....	4		
AE 427 Agricultural Process Engineering .....		3	
AE 461, AE 462 Senior Project .....	2	2	
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			
IE 314 Engineering Economics .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3

	F	W	S
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
HUM 402 Human Values (C.3.) .....		3	
Elective .....	3		
	16	17	16



CURRICULUM IN MECHANIZED AGRICULTURE

	F	W	S
<b>Freshman</b>			
AE 128 Agricultural Mechanics .....		3	
AE 133 Agricultural Drafting .....	3		
AE 141 Agricultural Tractors and Equipment Skills .....	3		
AE 143 Power and Machinery .....			4
MATH 113 Algebra .....	3		
MATH 114 College Algebra (B.2.) .....		3	
MATH 115 Trigonometry (B.2.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ETMP 144 Manufacturing Processes: Turning-Milling and			
ETMP 145 Manufacturing Processes .....	2	1	
ETWT 144 Manufacturing Processes .....		2	
ETWT 155 Industrial Welding Technology .....			1
Plant production elective .....			4
SS 121 Soils .....		4	
Animal production elective .....			4
	15	16	16
<b>Sophomore</b>			
ACTG 211 Financial Accounting for Nonbusiness Majors .....			4
AE 231 Agricultural Building Construction .....	3		
AE 134 Agricultural Electrification .....	3		
AE 234 Agricultural Power Transmission and Mechanics .....		3	
AE 335 Agricultural Power .....		3	

	F	W	S
AE 237 Engineering Surveying .....	2		
AE 341 Gasoline Engine Diagnosis .....			3
AM 250 Computer Application to Agriculture or CSC 110 Computers and Computing (F.1.) .....	3		
STAT 211 Elementary Probability and Statistics .....		3	
PHYS 121, PHYS 122, PHYS 123 College Physics (B.1.a.) .....	4	4	4
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Electives .....	3		3
	18	17	17
<b>Junior</b>			
AE 323 Agricultural Products Handling .....			3
AE 340 Irrigation Water Management .....	4		
AE 342 Diesel Fuel Systems .....			3
AE 343 Project Analysis .....	5		
AE 344 Agricultural Equipment Projects .....		3	
AE 347 Principles of Agricultural Machinery .....		4	
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
BUS 201 Business Law Survey .....			3
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> Critical reading elective (C.1.) .....		3	
	16	17	19
<b>Senior</b>			
AE 301 Closed Circuit Hydraulics .....	3		
AE 324 Principles of Agricultural Electrification .....		4	
AE 432 Agricultural Buildings .....			4
AE 425 Computer Controls for Agriculture .....			3
AE 461, AE 462 Senior Project .....	2	2	
AE 463 Undergraduate Seminar .....	2		
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
HUM 402 Human Values (C.3.) .....		3	
AM 312 Agricultural Policy .....		3	
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>1</sup> Electives .....		2	
	16	17	16

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Agricultural Engineering and other subjects.

<sup>1</sup> 6 units must be selected from courses in the School of Agriculture and Natural Resources.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

## AGRICULTURAL MANAGEMENT DEPARTMENT

Department Head, M. LeRoy Davis

James J. Ahern  
Renny J. Avey  
Steven C. Blank  
Gaylord J. Chizek  
Arthur C. Duarte  
Douglas G. Genereux  
George J. Hellyer

John J. Herlihy  
H. Clay Little  
Robert E. McCorkle  
William K. Michaud  
Nancy C. Morris  
John A. Rogalla

Allen E. Rosenfeld  
David J. Schaffner  
Jack F. Scott  
Duane O. Seaberg  
Robert C. Thompson  
Marlin D. Vix

The Bachelor of Science degree in Agricultural Management emphasizes training in management for careers in agriculture. The curriculum is based on a solid background in production agriculture which provides for depth and breadth in agricultural management techniques. The thrust of the program is to prepare students for careers in the management and operation of farms as well as in the management procedures required by firms that supply the service to farms and by those engaged in processing, marketing, distribution and sales of farm products.

The Agricultural Management curriculum provides a choice of two options to meet the specialized needs of students: 1) Agricultural Business Management and 2) Farm Management. The courses required in these options are listed following the year-by-year presentation of the basic curriculum. Supporting courses include accounting, statistics, law, and economics, as well as courses in general education areas of English, mathematics, history, political science, and psychology.

Students are required to take 30 units of agricultural production courses which are closely related to obtaining a background in management techniques for agriculture.

### CURRICULAR OPTIONS

#### Agricultural Business Management

Career placement opportunities for graduates of this program involve management operations required by agribusiness firms providing supplies and service to farmers and by those firms engaged in marketing, distribution, and sales of farm products. These careers include sales representatives for agricultural chemical organizations and fertilizer companies and may lead into more responsible management positions. Other careers are found in farm credit institutions, farm brokerage and property management firms, advertising, food chains, food processing, and agricultural county and district fairs.

#### Farm Management

Career placement opportunities for graduates of this option include management of farms, ranches, or feedyards in family businesses or on large-scale farms. Graduates are provided with the specialization needed to analyze and manage farm operations. Careers in farm appraisal also are available to these graduates.



## CURRICULUM IN AGRICULTURAL MANAGEMENT

Freshman	F	W	S
AM 101 Introduction to Agricultural Management .....	3		
AM 102 Introduction to Agricultural Economics .....		3	
MATH 113/MATH 118/MATH 121 .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
MATH 114/MATH 121/MATH 221 (B.2.) .....			3
<sup>1</sup> Life sciences elective (with lab) (B.1.b.) .....		4	
CRSC 131 Crop Science or			
FRSC 131 Pomology .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ASCI, DH, or PI approved elective .....			4
<sup>2</sup> Electives .....	5	3	3
	16	16	16
Sophomore			
ECON 211 Principles of Economics (D.3.) .....	3		
AM 212 Agricultural Economics .....		3	
AM 213 Agricultural Economic Analysis .....			4
ACTG 211 Financial Accounting .....		4	
STAT 211/STAT 251 and STAT 212/STAT 252 (B.2.) .....		3	3
HIST 204 Growth of American Democracy (D.1.) .....			3
CHEM 121 General Chemistry (B.1.a.) .....	4		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
AM 250 Computer Application to Agriculture (F.1.) .....			3
SS 121 Soils .....	4		
<sup>2</sup> Electives and courses to complete option .....	2	7	4
	17	17	17
Junior			
AM 301 Agricultural Marketing .....	3		
AM 310 Agricultural Credit and Finance .....	3		
AM 312 Agricultural Policy .....		3	
AM 322 Principles of Farm Management .....		4	
AM 360 Agricultural Management Research Methods .....			3
<sup>1</sup> Science elective (life sciences with lab or			
CHEM 122 General Chemistry) (B.1.) .....			4
POLS 210 American and California Government (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
PE 250 Health Education (E.2.) .....			2
<sup>2</sup> Electives and courses to complete option .....	5	4	5
	17	17	17

	F	W	S
<b>Senior</b>			
AM 401 Agricultural Labor Relations and Personnel Management ..	4		
BUS 201 Business Law Survey .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
AM 461, AM 462 Senior Project .....	2	3	
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		6	
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
AM 463 Undergraduate Seminar .....			2
<sup>2</sup> Electives and courses to complete option .....	7	4	8
	16	16	16

**AGRICULTURAL BUSINESS MANAGEMENT OPTION**

(Add Courses Below to Basic Curriculum)

<b>Sophomore</b>		<b>Senior</b>	
AM 201 Agricultural Business Sales and Service .....	(3)	AM 404 Agricultural Marketing Management .....	(3)
AM 203 Agricultural Business Organization .....	(3)	AM 406 Agricultural Business Communication .....	(3)
<b>Junior</b>		AM 421 Agricultural Business Operations Analysis' .....	(4)
AM 323 Agricultural Business Managerial Accounting .....	(4)	AM elective .....	(3)
AM elective .....	(3)		
AM 324 Agricultural Property Management .....	(4)		

**FARM MANAGEMENT OPTION**

(Add Courses Below to Basic Curriculum)

<b>Sophomore</b>		<b>Senior</b>	
AM 321 Farm Records .....	(4)	AM 415 Livestock Management Problems or	
<b>Junior</b>		AM 416 Dairy Management Problems .....	(3)
AM 326 Farm Appraisal .....	(4)	AM 431 Large Farm Accounting .....	(4)
AM 413 Crop Management Problems .....	(3)	AM 433 Agricultural Price Analysis ....	(3)
AM elective .....	(3)	AM 435 Linear Programming in Agriculture .....	(3)
		AM elective .....	(3)

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> Electives must include 18 units to be selected in Agriculture with prefixes other than AM or AGED. Of these units, 6-8 must be selected from the following courses: AE 340, ASCI 302, CRSC 221, SRCS 311, SS 221, VS 203, VS 302.

## ANIMAL AND VETERINARY SCIENCE DEPARTMENT

Department Head (Interim), Richard J. Birkett

Russell K. Anderson	Roy M. Harris	Robert T. Rutherford
Gene A. Armstrong	Robert D. Hooks	Kenneth C. Scotto
Blair R. Cooper	Roger M. Hunt	Dale A. Smith
James R. Flanagan	James W. Jacobs	John V. Stechman
Frank W. Fox, Jr.	Richard F. Johnson	Andrew J. Thulin
Wallace F. Glidden	William E. Plummer	Robert R. Wheeler
Michael H. Hall		

The Bachelor of Science degree in Animal Science educates men and women for the occupation of farming where beef cattle, horses, sheep, and swine enterprises are an important part of the industry. The majority of graduates from the department are engaged in the livestock and farming business or are employed as ranch workers or managers.

Livestock feeding yards, feed mills, auction sales companies, meat packers, commission firms, and other organizations servicing the livestock industry are sources of employment for graduates. Other employment fields include agricultural teaching, agricultural extension work, and agricultural research in the areas of animal nutrition, genetics, and reproductive physiology. The department allows wide latitude in the selection of elective courses so that students may pursue a secondary emphasis area or broaden the cultural base of their total college education.

The educational approach of the Department is to provide students with instruction in theory and application of all phases of livestock production and range management. To this end the Department maintains purebred and commercial instructional herds of the chief meat animal species, and a brood mare band of Thoroughbreds and Quarter Horses. The University herds and flocks are extensively used for laboratory and applied studies of management, feeding, breeding, and marketing techniques and procedures.

The student is encouraged to augment classroom and laboratory instruction through participation in the varied enterprise programs operated by the California Polytechnic State University Foundation. Through these programs large numbers of student-owned beef cattle, sheep and hogs are fed and marketed each year. Provision also is made to give the students an opportunity to own and manage, in partnership with the Foundation, a commercial cow herd and a prototype range band of ewes.

Instruction in the Department also encompasses a diversified cocurricular program including special interest clubs and the sponsorship of championship-calibre national intercollegiate teams livestock judging.

### CURRICULUM IN ANIMAL SCIENCE

Freshman	F	W	S
ASCI 111 Market Beef Production .....		3	
ASCI 112 Elements of Swine Production .....	3		
ASCI 113 Elements of Sheep Production .....			3
AE 121/AE 122 Agricultural Mechanics .....	2		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education (E.2.) .....	2		
ZOO 131 General Zoology (B.1.b.) .....		4	
CHEM 121, CHEM 122 General Chemistry .....		4	4
ASCI 241 Applied Beef Cattle Practices .....		2	
ASCI 242 Applied Swine Management Practices .....	2		
ASCI 243 Applied Sheep Management Practices .....			2
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Mathematics elective (B.2.) .....	3		
Electives .....	2		5
	18	16	17

# 100 Animal and Veterinary Science

Sophomore	F	W	S
ASCI 202 Feeds and Feeding .....	3		
ASCI 240 Applied Feeds and Feeding .....	2		
VS 123 Anatomy and Physiology .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....	3		
SS 121 Soil Science .....			4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....		3	
CHEM 326 Survey of Organic Chemistry .....			4
VS 203 Animal Parasitology .....		3	
BACT 221 General Bacteriology (B.1.b.) .....	4		
HIST 204 Growth American Democracy (D.1.) .....		3	
CRSC 123 Forage Crops .....			4
FDSC 210 Meats .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
Electives .....	2		2
	17	15	17
Junior			
ASCI 302 Applied Animal Nutrition .....		3	
HIST 315 Modern World History (D.2.) .....	3		
VS 302 Animal Hygiene .....	3		
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
POLS 210 American and California Government (D.1.) .....	3		
PSY 202 General Psychology (E.1.) .....			3
BIO 303 Genetics .....		3	
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
AM 321 Farm Records .....		4	
<sup>1</sup> Computer science elective or AM 250 Computer Application to Agriculture (F.1.) .....			3
CHEM 328 Biochemistry (B.1.a.) .....			4
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
Electives .....	4		
	16	16	16
Senior			
ASCI 304 Animal Breeding .....		3	
ASCI 401 Reproductive Physiology .....	4		
ASCI 402 Animal Nutrition .....		4	
ASCI 461, ASCI 462 Senior Project .....	2		2
ASCI 463 Undergraduate Seminar .....		2	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
<sup>2</sup> Animal Science electives .....		4	8
<sup>3</sup> Electives and courses to complete major .....	6	4	4
	16	17	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Animal Science and Veterinary Science and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected with adviser's approval.

<sup>3</sup> Seven units to be selected from 300-400 level courses in ASCI, DSCI, FDSC, PI, or VS.

## CROP SCIENCE DEPARTMENT

Department Head, Corwin M. Johnson

Charles B. Atlee  
Edgar H. Beyer  
William J. Cox  
A. Charles Crabb  
H. Paul Fountain

George G. Gowgani  
Louis W. Harper  
Robert J. McNeil  
Gene P. Offermann  
John C. Phillips

Mark D. Shelton  
Gordon L. Van De Vanter  
David L. Warfield  
Jo Ann C. Wheatley

Two major curricula leading to the Bachelor of Science degree are offered by the Crop Science Department and are designed to prepare students for field, fruit, or vegetable crop production and for employment in related service areas.

Graduates in Crop Science and Fruit Science have attained responsible positions in agronomic and horticultural production, teaching, research, extension, quality control and inspection, and sales and service areas. Opportunities for employment in private industry and governmental sectors are available for those with practical knowledge of agricultural skills and techniques and a good background in the sciences and humanities.

The Department has 30 acres of productive citrus, avocados, grapes, deciduous orchard, and berries with over 100 varieties represented. Additional nonbearing acreage for instructional use exists and new plantings are under way. About 300 acres are devoted to student production enterprises in field and vegetable crops. An additional 200 acres of campus farm crop land provide opportunities to gain experience through part-time employment. All departmental majors are encouraged to gain experience and earn income by participation in the project enterprise program or by working for the campus farm.

The technological phases of instruction are enhanced by packing and grading equipment, seed processing equipment, and specialized laboratory equipment for the study of various crops. Field trips supplement instruction for crops not common to the San Luis Obispo area.

Students interested in the two-year technical certificate should refer to the School of Agriculture and Natural Resources introductory statement. The department head can supply additional information.

### CROP SCIENCE MAJOR

A student in the Crop Science major must elect to specialize in Agronomy, Plant Protection, or Vegetable Science in the junior and senior years. Employment opportunities for students graduating in the Crop Science major include private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculturally related organizations, and as agronomists and horticulturists with government or industry.

### FRUIT SCIENCE MAJOR

The Fruit Science major qualifies graduates for orchard or vineyard management or for related employment for packers or canners, fruit inspection, or plant protection. Instruction includes deciduous fruits, nut crops, citrus, avocados, grapes, berries, tropical and subtropical fruits, and minor fruit species. Students may elect to specialize in Fruit Production or Plant Protection in the junior and senior years.

### CURRICULUM IN CROP SCIENCE

Freshman		F	W	S
CRSC 131	Introduction to Crop Science .....	4		
CRSC 132	Grain Crops .....		4	
CRSC 133	Row Crops .....			4
	Agricultural Engineering electives .....	3		3
BOT 121	General Botany (B.1.) .....	4		
BOT 123	Introductory Plant Taxonomy .....		4	
ENGL 114	Writing: Exposition (A.1.) .....	4		
ENGL 218	Writing: Argumentation and Reports (A.4.) .....			4

	F	W	S
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
LIB 101 Library Instruction .....		1	
MATH 102 Agricultural Mathematics .....		3	
MATH 114 College Algebra (B.2.) .....			3
PE 250 Health Education (E.2.) .....	2		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
	<u>17</u>	<u>15</u>	<u>17</u>
<b>Sophomore</b>			
CRSC 221 Weed Control .....	4		
CRSC 231 Commercial Seed Production and Processing.....		4	
VGSC 232 Vegetable Crops Production .....			4
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
SS 121 Soils .....	4		
SS 122 Soil Management or			
SS 221 Fertilizers .....		4	
SPC 202 Principles of Speech (A.3.) .....			3
PSY 202 General Psychology (E.1.) .....	3		
ECON 211 Principles of Economics (D.3.) .....		3	
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
Electives .....	<u>2</u>	<u>2</u>	<u>2</u>
	<u>17</u>	<u>17</u>	<u>16</u>
<b>Junior</b>			
CRSC 411 Experimental Techniques and Analysis .....	4		
AM 250 Computer Application to Agriculture (F.1.) .....		3	
AM 321 Farm Records .....			4
Agricultural Management elective (300-400 level) .....		4	
CHEM 328 Biochemistry (B.1.a.) .....	4		
FRSC 230 California Fruit Growing .....			4
CRSC 311 Applied Insect Pest Management .....	4		
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....	2	4	
<sup>2</sup> Electives .....		<u>3</u>	<u>6</u>
	<u>17</u>	<u>17</u>	<u>17</u>
<b>Senior</b>			
CRSC 304 Plant Breeding .....			4
CRSC 461, CRSC 462 Senior Project .....	2	3	
CRSC 463 Undergraduate Seminar .....			2
BIO 303 Genetics .....	3		
BOT 323 Plant Pathology (B.1.b.) .....	4		
CRSC 410 Crop Physiology .....		4	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>2</sup> Electives .....	<u>4</u>	<u>3</u>	<u>4</u>
	<u>16</u>	<u>16</u>	<u>16</u>

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> At least four courses to be selected with the approval of the adviser, three of which must be 300-400 level courses.

## CURRICULUM IN FRUIT SCIENCE

		F	W	S
<b>Freshman</b>				
FRSC 131, FRSC 132, FRSC 133	Pomology .....	4	4	4
MATH 102	Agricultural Mathematics .....	3		
MATH 114	College Algebra (B.2.) .....		3	
Agricultural Engineering electives .....		2		4
ENGL 114	Writing: Exposition (A.1.) .....	4		
ENGL 218	Writing: Argumentation and Reports (A.4.) .....			4
ENGL 125/PHIL 125/SPC 125	Critical Thinking (A.2.) .....		3	
PE 250	Health Education (E.2.) .....		2	
BOT 121, BOT 123	General Botany (B.1.b.) .....	4	4	
ANT 201/GEOG 150/SOC 105	elective (D.4.) .....			3
LIB 101	Library Instruction .....			1
<sup>1</sup> Elective .....				1
		17	16	17
<b>Sophomore</b>				
FRSC 231	Viticulture .....	4		
FRSC 232	Fruit Plant Propagation .....		4	
CHEM 121, CHEM 122	General Chemistry (B.1.a.) .....	4	4	
CHEM 326	Survey of Organic Chemistry .....			4
SS 121	Soils .....	4		
SS 122	Soil Management or			
SS 221	Fertilizers .....		4	
BOT 323	Plant Pathology (B.1.b.) .....			4
CRSC 221	Weed Control .....			4
SPC 202	Principles of Speech (A.3.) .....	3		
ECON 211	Principles of Economics (D.3.) .....		3	
<sup>1</sup> Electives .....		2	2	5
		17	17	17
<b>Junior</b>				
STAT 211	Elementary Probability and Statistics (B.2.) .....			3
CRSC 311	Applied Insect Pest Management .....	4		
CRSC 411	Experimental Techniques and Analysis .....			4
CHEM 328	Biochemistry (B.1.a.) .....		4	
BIO 303	Genetics (B.1.b.) .....	3		
AM 250	Computer Application to Agriculture (F.1.) .....			3
AM 321	Farm Records .....	4		
PSY 202	General Psychology (E.1.) .....	3		
<sup>2</sup> ART/MU/TH	elective (C.2.) .....	3		
<sup>2</sup> Literature, philosophy, arts	electives			
(3 units at 300-400 level)	(C.3.) .....		6	
<sup>1</sup> Electives .....			5	6
		17	15	16
<b>Senior</b>				
FRSC 421	Advanced Pomology .....	4		
FRSC 332	Citrus and Avocado Fruit Production .....		4	
CRSC 304	Plant Breeding .....	4		
CRSC 461, CRSC 462	Senior Project .....	2	3	
CRSC 463	Undergraduate Seminar .....			2
VGSC 230	General Vegetable Crops or			
CRSC 230	General Field Crops .....		4	
Agricultural Management elective (300-400 level) .....				4
POLS 210	American and California Government (D.1.) .....	3		
HIST 204	Growth of American Democracy (D.1.) .....		3	
HIST 315	Modern World History (D.2.) .....			3

	F	W	S
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
<sup>1</sup> Elective .....			1
	16	17	16

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Crop Science, Fruit Science, Vegetable Science and other subjects.

<sup>1</sup> At least 12 units to be selected with the approval of the adviser from 300-400 level courses.  
<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)





## DAIRY SCIENCE DEPARTMENT

Department Head, Eugene E. Starkey

Leslie S. Ferreira  
Timothy J. LaSalle

Carl F. Moy  
Gary D. Reif

Herman E. Rickard

### DAIRY SCIENCE MAJOR

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, including husbandry and manufacturing, as well as the related and allied fields. The basic curriculum is arranged to serve all students within the major with further courses included in the two options of husbandry and manufacturing to provide depth of instruction in either field.

The curriculum provides adequate elective units to complete a minor or select additional courses in various areas of your choice. Recommendations are available from faculty advisers.

Excellent facilities are provided for students selecting either of the options. The dairy herd includes purebred Jerseys, Guernseys, and Holsteins, located on a well-planned unit, where feeding, milking, calf raising, artificial insemination, and management are carried out. The campus creamery is a new and modern plant, well equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas. A separate dairy located on campus provides an opportunity for students with dairy projects. This farm accommodates 80-100 head of project cattle owned and cared for by students. There are two, six-unit dormitories at this project farm.

### CURRICULAR OPTIONS

#### Husbandry

The Dairy Husbandry Option emphasizes the preparation of students in production and management areas of the industry, including the selection, management, feeding and breeding of dairy cattle, and efficient, economical milk production.

#### Manufacturing

The Dairy Manufacturing Option emphasizes preparation for participation in the processing and distribution field, including sales, quality control, field work and dairy inspection.

### CURRICULUM IN DAIRY SCIENCE

Freshman	F	W	S
DH 121 Elements of Dairying .....	4		
DH 101 Dairy Feeds and Feeding .....	2		
DH 102 Feeding Dairy Cattle .....		2	
DM 133 Milk Processing and Merchandising .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>1</sup> Mathematics electives (B.2.) .....		3	3
ZOO 131 General Zoology (B.1.b.) .....		4	
BOT 121 General Botany .....	4		
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
<sup>2</sup> Restricted elective .....			2
Electives and courses to complete major .....	3	5	5
	17	17	16

	F	W	S
<b>Sophomore</b>			
DM 212 Dairy Processing Technology .....		4	
DH 221 Milk Production .....	4		
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....		3	
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3		3
BACT 221 General Bacteriology (B.1.b.) .....	4		
PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> Computer literacy elective (F.1.) .....			3
ACTG 211 Financial Accounting .....	4		
Electives and courses to complete major .....		3	5
	18	16	17
<b>Junior</b>			
DM 233 Dairy Foods Evaluation .....			2
DM 332 Dairy Inspection .....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
POLS 210 American and California Government (D.1.) .....	3		
PHYS 121 College Physics .....	4		
Electives and courses to complete major .....	6	12	3
	17	16	16
<b>Senior</b>			
DH 461, DH 462 Senior Project .....	2	2	
DH 463 Undergraduate Seminar .....			2
CHEM 328 Biochemistry .....	4		
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
Electives and courses to complete major .....	7	8	8
	16	16	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected with adviser's approval.

## HUSBANDRY OPTION

(ADD COURSES BELOW TO BASIC CURRICULUM)

## Freshman

- DH 142 Dairy Cattle Selection ..... (2)  
 SS 121 Soils ..... (4)

## Sophomore

- DH 222 Commercial Dairy Herd  
 Management ..... (4)  
 VS 123 Anatomy and Physiology ..... (3)  
 VS 302 Animal Hygiene ..... (3)

## Junior

- DH 301 Advanced Dairy Cattle  
 Feeding ..... (3)

- DH 323 Breeds, Pedigrees and  
 Management ..... (4)  
 BIO 303 Genetics ..... (3)  
 DH 330 Artificial Insemination ..... (2)

## Senior

- DH 422 Breeding and Selection of  
 Dairy Cattle ..... (4)  
 ASCI 402 Animal Nutrition ..... (4)  
 AM 212 Agricultural Economics ..... (3)

## MANUFACTURING OPTION

(ADD COURSES BELOW TO BASIC CURRICULUM)

## Freshman

- DM 132 Frozen Dairy Foods ..... (4)

## Sophomore

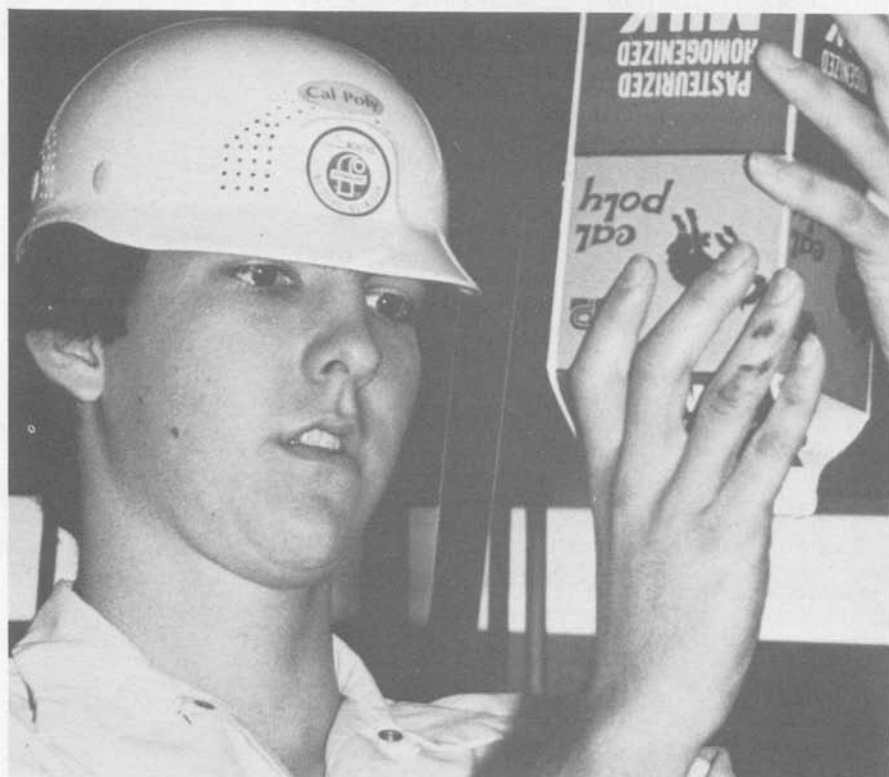
- DM 336 Butter and Dairy Spreads .... (4)  
 BACT 322 Dairy Bacteriology ..... (4)

## Junior

- DM 331 Condensed and Dry Milk .... (4)  
 DM 334 Cheese ..... (4)  
 Management elective ..... (3)  
 DM 326 Fermented Dairy Foods ..... (3)

## Senior

- DM 433 Dairy Plant Management and  
 Equipment ..... (4)



## FOOD SCIENCE DEPARTMENT

Department Head, Robert D. Vance

Norman R. Eggen  
Thomas M. Lukes

Joseph Montecalvo, Jr.  
O. Robert Noyes

Mary Y. Wang  
Rudy A. Wooten

The Bachelor of Science degree in Food Science is designed to prepare students for employment in the various phases of the commercial food processing industry. Instruction qualifies students for careers in production, quality control, food technology, marketing, and management. Employment opportunities for graduates are excellent.

The curriculum provides applied knowledge of the industry that will enable the graduate to accomplish production and management jobs connected with operations of the industry from field to market. Skills acquired in the operations aspects of the industry are coordinated with studies in science, business, and humanities.

The departmental laboratories include complete facilities for small scale commercial production of canned, frozen, dehydrated and concentrated fruit and vegetable products. Meats laboratories provide for complete processing of meat including slaughtering, cutting, curing, smoking and sausage manufacture.

### CURRICULUM IN FOOD SCIENCE

Freshman	F	W	S
FDSC 122 Introductory Food Engineering .....	4		
FDSC 150 Processed Food Inspection .....		3	
FDSC 209 Meat Procurement and Use or			
FDSC 210 Meats .....	3		
HE 210 Nutrition (E.2.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
POLS 210 American and California Government (D.1.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....		4	4
DM 230 General Dairy Manufacturing .....		4	
PHYS 104 Introductory Physics .....			4
<sup>2</sup> Plant science elective .....			4
	17	17	15
Sophomore			
FDSC 241, FDSC 243, FDSC 245 Unit Processing Operations .....	4	3	3
BACT 221 General Bacteriology .....	4		
CHEM 326 Survey of Organic Chemistry .....		4	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
CHEM 328 Biochemistry (B.1.a.) .....			4
PSY 201 General Psychology (E.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
<sup>2</sup> Animal Science elective .....			4
<sup>1</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....		3	3
<sup>1</sup> Elective .....			3
	17	17	17

	F	W	S
<b>Junior</b>			
FDSC 321 Food Quality Control .....	3		
FDSC 332 Statistical Quality Control .....		3	
FDSC 336 Packaging .....	3		
FDSC 331 Sanitation and Waste Disposal .....	3		
FDSC 338 Meat Processing .....		3	
FDSC 341 Wines and Fermented Foods .....			3
FDSC 350 Advanced Food Engineering .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
AM 250 Computer Application to Agriculture (F.1.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
<sup>2</sup> Business electives .....		3	3
<sup>3</sup> Critical reading electives (C.1.) .....	3	3	
<sup>3</sup> Electives .....	2	2	2
	17	17	17
<b>Senior</b>			
FDSC 421 Advanced Food Processing .....	3		
FDSC 422 Food Composition Science .....		4	
FDSC 425 Food Evaluation .....		3	
FDSC 431 Advanced Meats .....			3
FDSC 433 Food Processing Management .....			3
BACT 421 Food Microbiology (B.1.b.) .....	4		
FDSC 461, FDSC 462 Senior Project .....	2	2	
FDSC 463 Undergraduate Seminar .....			2
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>3</sup> Electives .....	7	3	5
	16	15	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Food Science and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> Refer to departmental list of courses which satisfy Plant Science, Animal Science and Business electives.

<sup>3</sup> 6 of these elective units must be chosen from departmental list of approved electives (see adviser).

## NATURAL RESOURCES MANAGEMENT DEPARTMENT

Department Head (Interim), Norman H. Pillsbury

Michael T. Hanson  
John H. Harris  
Anthony E. Knable

Timothy G. O'Keefe  
Timothy R. Plumb  
James R. Vilkitis

Robert F. Wambach  
Marvin J. Whalls

Natural resources are vital to the well-being of the nation. Increasing utilization of natural resources for economic uses and outdoor recreation is reflected in a demand for graduates prepared to assume positions of major responsibility. The Natural Resources Management Department prepares students for careers in the management and protection of our nation's natural resources: water, air, land, forests, fish and wildlife, and recreation.

A curriculum leading to the Bachelor of Science degree is offered by the Natural Resources Management Department in Natural Resources Management.

Graduates enter employment with federal agencies such as the Forest Service, Park Service, Soil Conservation Service, and Bureau of Land Management; state agencies such as Natural Resources, Parks and Recreation, Fish and Game and Forestry; local agencies such as Park Authorities, Regional Forests and County Parks; city and county planning departments; and private industry such as lumber companies, utility companies, hunting preserves, oil companies, rural recreational enterprises, and environmental management and consulting firms. Qualified graduates are prepared to pursue graduate studies and/or research opportunities.

The departmental facilities provide opportunity for development of skills necessary for natural resources management. Field practices utilize special campus sites (ponds, tree nurseries, green houses) and nearby public and private resource areas, regional and state parks, and National Forests.

The curriculum in Natural Resources Management provides a full range of courses in the humanities and the basic sciences and requires the completion of a concentration of courses in a field of specialization to meet professional and employment requirements. Pregraduation employment in a natural resources area and internships reinforce classroom and laboratory experiences, and enhances opportunities for postgraduate student employment.

### CURRICULAR CONCENTRATIONS

#### Environmental Services

The environmental services concentration prepares students for employment as professionals in the fields of resource planning, environmental impact assessment and evaluation, environmental policy analysis, forest hydrology, soil conservation, and range conservation. Individual student programs are developed.

#### Fishery and Wildlife Management

The fishery and wildlife management concentration prepares students for employment in the fish and wildlife areas of law enforcement, management, and production.

#### Forest Resources Management

The forest resources management concentration prepares students for entry into the profession of forestry. Students are able to obtain immediate application of forest management principles. The curriculum provides broad training in forest resource management with emphasis in urban forestry; watershed, chaparral and fire management; hardwood management; and wood energy systems. Extensive field training occurs concurrently with classroom instruction. Cal Poly is a candidate institution for accreditation through the forest resources concentration by the Society of American Foresters. Also, employment as a forester with the Federal Government is recognized by the U.S. Office of Personnel Management.

#### Parks and Outdoor Recreation

The parks and recreation concentration prepares students for employment in the planning, interpretation, development, and management of governmental and private resource-based parks and other recreational lands.

CURRICULUM IN NATURAL RESOURCES MANAGEMENT

Freshman	F	W	S
NRM 112 Parks and Outdoor Recreation .....		3	
NRM 120 Fisheries and Wildlife Management .....			3
FOR 201 Forest Resources .....	3		
BOT 121 General Botany (B.1.b.) .....		4	
BOT 123 Introductory Plant Taxonomy .....			4
MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
SS 121 Soils .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education (E.2.) .....			2
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>2</sup> Major or support courses .....	3	4	3
	18	17	16
Sophomore			
CSC 110 Computers and Computing (F.1.) .....		3	
STAT 211 Elementary Probability and Statistics and STAT 212 Statistical Methods (B.2.) .....	3	3	
CHEM 121 General Chemistry (B.1.a.) .....		4	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PHYS 121 College Physics (B.1.a.) .....			4
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....			3
ECON 211 Principles of Economics (D.3.) .....	3		
POLS 210 American and California Government (D.1.) .....		3	
<sup>2</sup> Major or support courses .....	5	5	4
	17	18	18
Junior			
NRM 302 Natural Resources Policy .....	3		
NRM 304 Ecology of Resource Areas .....		4	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
<sup>2</sup> Major or support courses .....	3		6
Elective .....		2	
<sup>2</sup> Concentration courses .....	3	7	4
	15	16	16

	F	W	S
Senior			
NRM 401 Natural Resource Economics .....		3	
FOR 440 Watershed Management .....			4
NRM 406 Natural Resources Administration .....	4		
FOR 461/NRM 461 Senior Project .....	2		
AE 345 Aerial Photogrammetry .....	3		
<sup>2</sup> Major or support courses .....		6	3
<sup>2</sup> Concentration courses .....	4	4	6
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
Electives .....	2		3
	15	16	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Natural Resources Management, Forest Resources and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> Courses to be chosen with the approval of the adviser, including 28 units in a field of concentration.





## ORNAMENTAL HORTICULTURE DEPARTMENT

Department Head, Ronald D. Regan

Stephen F. Angley  
Patricia H. Breckenridge  
Charlotte B. Burns  
E. Wesley Conner  
James A. D'Albro  
Thomas E. Eltzroth

Winton H. Frey  
Timothy A. Gaskin  
Robert L. Gordon  
David W. Hannings  
Kenneth E. Kline  
Daniel E. Lassanske

William E. Noble  
Marshall E. Ochylski  
Robert P. Rice  
Virginia R. Walter  
Michael D. Zohns

The Bachelor of Science degree in Ornamental Horticulture offers the student a comprehensive preparation for attractive positions in the nursery, greenhouse, landscape, and florist industries. This includes both the production and sales-service areas of these major fields. The curriculum stresses production and marketing of nursery plants, cut flowers, pot plants, and tropical foliage plants; landscape design, planting and supervision; and floral design and marketing.

Graduates of the Ornamental Horticulture Department qualify for management positions in nursery, greenhouse, and florist establishments, as well as supervisory positions in parks and grounds. Many of the graduates enter the field of teaching. Some of the most popular areas of employment include plant propagation, nursery sales, cut flower and pot plant production, greenhouse management; landscape design, construction, and maintenance management; the field of advising for fertilizer and pesticide companies; and floral design and floral shop management.

The facilities of the department include a student-operated commercial greenhouse range and nursery in which students carry on a project program involving wholesale and retail sales and a student-operated florist shop in which, in addition to plant sales, students design and sell floral pieces. Also included are 35,000 square feet of greenhouses, including a solar-heated house, 7,500 square feet of shadehouses, and an extensive field container growing area. Large, modern, well-equipped laboratories, including a tissue culture laboratory, adjoin the greenhouse range. In addition to 200 acres of landscaped campus, an arboretum is also utilized as an outdoor laboratory. The campus is planted with many interesting and unusual trees and shrubs from all over the world, as well as native plant materials.

Also available are the latest models of equipment necessary in nurseries, greenhouses, parks and grounds, landscaping, and florist shops. An extensive list of periodicals covering the field of ornamental horticulture is available to students. Through the staff, affiliation in several national and state horticultural organizations is maintained.

Students interested in the two-year technical certificate should refer to the introductory statement for the School of Agriculture and Natural Resources which describes this program. Detailed curriculum information is available from the department head.

### CURRICULAR CONCENTRATIONS

#### Floriculture and Nursery Production

This concentration is designed to educate and prepare the student for production and management in the floriculture and nursery industries.

#### Horticulture Sales and Services

This concentration is designed to educate the student in the business world as it relates to the specialized field of ornamental horticulture.

#### Landscape Industry

This concentration is designed to educate and prepare the student to be versatile in the fields of landscape design, installation and management.

## CURRICULUM IN ORNAMENTAL HORTICULTURE

Freshman	F	W	S
OH 100 Orientation to Ornamental Horticulture .....	1		
OH 101 Principles of Landscape Design I .....	3		
OH 126 Ornamental Horticulture Construction .....			2
OH 131, OH 132, OH 133 Fundamentals of Ornamental Horticulture .....	4	3	4
OH 134 Landscape Maintenance .....			3
SS 121 Soils .....		4	
AE 121 Agricultural Mechanics .....	2		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
MATH 115 Trigonometry or STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
BOT 121 General Botany (B.1.b.) .....		4	
BOT 123 Introductory Plant Taxonomy (B.1.b.) .....			4
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2	
	17	16	16
Sophomore			
OH 201 Principles of Landscape Design II .....			3
OH 231, OH 232, OH 233 Plant Materials .....	4	4	4
ENT 220 Agricultural Entomology or CRSC 311 Applied Insect Pest Management .....			4
SS 221 Fertilizers .....		4	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
ECON 201 Survey of Economics (D.3.) .....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
AE 141 Tractors .....			3
<sup>1</sup> Electives and courses to complete major .....	2	1	
	17	16	17
Junior			
OH 327 Diseases and Pests of Ornamental Plants .....			4
BOT 324 Ornamental and Forest Pathology .....	4		
ACTG 211 Financial Accounting for Non-Business Majors .....		4	
POLS 210 American and California Government (D.1.) .....			3
CHEM 326 Survey of Organic Chemistry .....		4	
BUS 201 Business Law Survey .....		3	
AM 250 Computer Application to Agriculture (F.1.) .....	3		
Approved science elective .....			4
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>1</sup> Electives and courses to complete major .....	7	6	5
	17	17	16

	F	W	S
<b>Senior</b>			
OH 460 Senior Seminar .....	1		
OH 461, OH 462 Senior Project .....	2	2	
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....			6
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
HIST 204 *Growth of American Democracy (D.1.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
CRSC/FRSC/VGSC elective (200-400 level) .....		4	
BOT 322 Introductory Plant Physiology (B.1.b.) .....	4		
<sup>1</sup> Electives and courses to complete major .....	3	1	5
	16	16	17

<sup>1</sup> Of the total elective units 29 must be chosen in a field of concentration with approval of the adviser; with a minimum of 18 units at 300-400 level.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Ornamental Horticulture and other subjects.



## POULTRY DEPARTMENT

Department Head, Philip L. Potts, Sr.

Roland K. Pautz

John W. West

The Bachelor of Science degree in Poultry Industry prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Opportunities in the industry are many and varied as evidenced by the fact that graduates have worked in more than fifty types of jobs in the industry.

Poultry students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The University has facilities for more than 5,000 adult and over 6,000 growing chickens on approximately 10 acres of land. The poultry unit maintains flocks of a number of breeds and varieties of chickens for both egg and meat production. Flocks of turkeys and several game bird species are maintained in support of the instructional program. A 15,000-egg capacity hatchery is equipped to hatch eggs ranging in size from quail to turkey. A well-equipped poultry processing plant and egg handling and processing facility enables students to gain experience in these areas.

Students interested in the two-year technical certificate should refer to the introductory statement for the School of Agriculture and Natural Resources, which describes this program. Detailed curriculum information is available from the department head.

### CURRICULUM IN POULTRY INDUSTRY

Freshman	F	W	S
PI 121 Poultry Industry Development .....	4		
PI 122 Replacement Programs and Broiler Production .....		4	
PI 133 Poultry Incubation .....			3
DH 101 Dairy Feeds and Feeding .....	2		
Agricultural Engineering electives .....		2	2
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.) .....	3		
PE 250 Health Education (E.2.) .....	2		
ZOO 131 General Zoology (B.1.b.) .....		4	
BOT 121 General Botany (B.1.b.) .....			4
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
Electives .....	2		4
	17	16	16
Sophomore			
PI 221 Poultry Selection and Egg Production .....	3		
PI 222 Poultry Products Processing and Marketing .....		3	
PI 233 Poultry Plant Design and Equipment .....			2
Agricultural Engineering or Welding elective .....	2		
PI 231 Poultry Anatomy and Physiology .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
BACT 221 General Bacteriology .....	4		
BIO 303 Genetics .....		3	

Poultry 117

	F	W	S
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>2</sup> Management elective .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
Electives .....	2	2	2
	17	17	17
<b>Junior</b>			
PI 331 Turkey Industry .....	3		
PI 322 Poultry Business Organization .....		4	
PI 323 Poultry Diseases and Hygiene .....			4
PI 333 Applied Poultry Feeding and Nutrition .....			4
Agricultural Engineering elective .....	3		
AM 321 Farm Records or			
ACTG 221 Financial Accounting I .....	4		
AM 212 Agricultural Economics or			
ECON 212 Principles of Economics .....		3	
POLS 210 American and California Government (D.1.) .....		3	
HIST 204 Growth of American Democracy (D.1.) .....			3
CHEM 121, CHEM 122 General Chemistry .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	3		
Electives .....		2	2
	17	16	17
<b>Senior</b>			
PI 422 Advanced Poultry Enterprise Supervision .....		3	
PI 431 Applied Poultry Breeding .....	4		
PI 461, PI 462 Senior Project .....	2	2	
PI 463 Undergraduate Seminar .....			2
AM 401 Agricultural Labor Relations and Personnel Management ..	4		
ASCI 402 Animal Nutrition .....			4
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
CHEM 328 Biochemistry (B.1.a.) .....		4	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> Computer science elective .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
<sup>2</sup> Management elective .....		3	
Elective .....			2
	16	15	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Poultry Industry and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected from BUS 201, MGT 118, MGT 311.

## SOIL SCIENCE DEPARTMENT

Department Head (Interim), Brent G. Hallock

Gaston Amedee  
Delmar D. Dingus  
Royce L. Lambert

Curtis Dean Piper  
Thomas J. Rice, Jr.  
Thomas A. Ruehr

Edwin C. Seim  
Terry L. Smith  
Ronald D. Taskey

The Bachelor of Science degree in Soil Science prepares graduates for professional positions in agriculture and natural resources, including agriculture teachers, farm advisers, farm managers, farm operators, fertilizer distributors, land appraisers or soil conservationists, and highly specialized positions such as laboratory technicians, soil specialists, and soil surveyors, and graduate studies.

Facilities of the department include laboratory, glasshouse space, and land and equipment to emphasize the practical application of classroom knowledge. The use of demonstration plots, agriculture internships, and the application of accepted cultural practices on the campus farm are among the methods of integrating the classroom with work experiences and careers.

Students majoring in soil science develop a broad background in the basic sciences. They are provided ample opportunities to apply the knowledge and skills learned to the practical solutions of agricultural problems. The students who select courses in soil science as electives will gain an appreciation for the importance of soil in fulfilling society's needs.

### CURRICULUM IN SOIL SCIENCE

Freshman		F	W	S
SS 100	Orientation in Soil Science .....	1		
SS 121	Soils .....	4		
SS 122	Soil Management .....		4	
	Agriculture support elective (from approved list) .....			4
	ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
<sup>1</sup>	Crop Science elective .....	4		
	CHEM 127, CHEM 128 General Chemistry (B.1.a.) .....		4	4
	ENGL 114 Writing: Exposition (A.1.) .....	4		
	ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>2</sup>	Mathematics or statistics electives (B.2.) .....		3	3
	BOT 121 General Botany (B.1.b.) .....	4		
	BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2-3	
<sup>2</sup>	Computer literacy elective (F.1.) .....			2-3
		17	16-17	16-17
Sophomore				
SS 202	Soil Conservation .....		3	
SS 221	Fertilizers .....	4		
	Agricultural support elective (from approved list) .....	4		
SS 223	Soil Materials .....	4		
	PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
	CHEM 129 General Chemistry .....	4		
	CHEM 326 Survey of Organic Chemistry .....		4	
	CHEM 328 Biochemistry .....			4
	ENGL 215 Writing: Argumentation or			
	ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
	ECON 201 Survey of Economics or			
	ECON 211 Principles of Economics (D.3.) .....			3
	POLS 210 American and California Government (D.1.) .....		3	
	HIST 204 Growth of American Democracy (D.1.) .....		3	
	PHYS 104 Introductory Physics or			
	PHYS 121 College Physics .....			4
	Electives .....			3
		16	17	17

Junior	F	W	S
SS 321 Soil Classification .....	4		
SS 322 Soil Fertility .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
AM 321 Farm Records or			
ACTG 211 Financial Accounting for Nonbusiness Majors .....	4		
<sup>1</sup> AM/BUS/MGT elective .....			3
BACT/BIO/BOT elective (300-400 level) .....		4	
BACT 221 General Bacteriology or			
BACT 224 General Microbiology (B.1.b.) .....	4		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
AE 340 Irrigation Water Management or			
FOR 440 Watershed Management .....			4
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
Science or Mathematics elective (from approved list) .....			4
Agriculture support elective (from approved list) .....		3	
	18	16	17
Senior			
SS 422 Soil Microbiology .....		3	
SS 423 Soil Chemistry .....			4
SS 432 Soil Physics .....	4		
SS 461 Senior Project .....	1		
SS 462 Senior Project .....		4	
SS 463 Undergraduate Seminar .....			2
CRSC 411 Experimental Techniques and Analysis .....			4
SS 433 Land Use Planning .....		3	
<sup>2</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....	3	3	
<sup>1</sup> AM/BUS/MGT elective (300-400 level) .....	3		
Agriculture support elective .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
Electives .....	4-5		2-3
	15-16	16	15-16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Soil Science and other subjects.

<sup>1</sup> Selected with approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)





# School of Architecture and Environmental Design

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B.Arch. Architecture .....	125
M.Arch. Architecture .....	127
B.S. City and Regional Planning .....	128
M.C.R.P. City and Regional Planning .....	130
B.S. Construction Management .....	131
B.S. Landscape Architecture .....	133

## SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Kenneth E. Schwartz, FAIA, Interim Dean  
K. Richard Zweifel, Interim Associate Dean

The School of Architecture and Environmental Design offers a Bachelor of Architecture degree and four bachelor of science degree programs: Architectural Engineering, City and Regional Planning, Construction Management, and Landscape Architecture. The student is kept aware that all five of these programs have a common objective and that they are all aimed at the betterment of the human physical environment. These programs endeavor to give the student a set of social values, a technical background, and training which result in creative expressions that are effective both professionally and personally.

Two graduate programs are offered: the Master of Architecture and the Master of City and Regional Planning. These programs are designed for students interested in advanced professional studies.

The excellent School facilities include design laboratories, dark rooms, soils laboratory, stress laboratory, shops, construction yard, project yard and grading galleries. An outlying area of 12 acres known as the "Canyon" is available for extensive experimental construction. The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for an environmental design school in that it permits concentration and provides for environmental studies ranging from rural to large metropolitan complexes. There is a continual stream of visiting lecturers. Field trips are arranged to various parts of the State as required work.

The School is a Member of the Association of Collegiate Schools of Architecture and maintains a Student Chapter of the American Institute of Architects and Scarab, the professional architectural fraternity. Likewise, student chapters of the American Planning Association, the Engineering Grading Contractors Association, the Construction Specification Institute, and the American Society of Landscape Architects are active and maintain liaison between the respective professional organizations and the School.

Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Reference should be made to the "Articulation Agreement" located in the community college counseling center. Transfers to Architecture and Architectural Engineering should take equivalent mathematics, physics and other general education courses. Wherever possible, the student preparation should include as much as possible of the following: 24 semester units of introductory architectural courses: Perspective 2, Freehand Drawing 1, Basic Graphics 2, Architectural Design 10, Materials of Construction 2, Architectural Drafting 4.

All student work submitted for course credit becomes School property and will be returned only at the discretion of the instructor.

## ARCHITECTURAL ENGINEERING DEPARTMENT

Department Head, David S. Hatcher

Thomas J. Ballew  
Michael W. Botwin  
John W. Edmisten

Jacob Feldman  
Hans L. Mager  
William R. Phillips

Satwant S. Rihal  
Shan Somayaji  
James H. Withers

The four-year program in Architectural Engineering leads to the Bachelor of Science degree and has its major emphasis in the structural engineering of buildings. Students are encouraged to develop aptitudes in science and mathematics for creative engineering accomplishments. Graduates of this program in general will seek professional registration as civil and structural engineers. Additional architectural studies also will permit graduates to achieve registration as architects. The Architectural Engineering curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (A.B.E.T.).

The curriculum prepares the student to enter the field of architectural engineering, structural engineering, and the technically oriented aspects of architecturally related fields. In addition, students are prepared to pursue graduate studies in the fields of structural engineering, structural mechanics, and foundation engineering.

### CURRICULUM IN ARCHITECTURAL ENGINEERING

Freshman	F	W	S
EDES 101 Introduction to Architecture and Environmental Design	2		
EDES 110 Descriptive Drawing .....		1	1
EDES 111 Introduction to Drawing and Perspective .....		3	
EDES 112 Basic Graphics .....			3
ARCH 102, ARCH 103 Environmental Design Fundamentals .....	2		2
ARCH 106 Materials of Construction .....			3
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>1</sup> PE 250 Health Education (E.2.) .....	2		
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
	18	17	17
Sophomore			
EDES 250 Computer Applications (F.1.) .....		2	
ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 223 Structural Analysis I .....			3
ARCE 301 Stress Analysis Laboratory .....			1
ARCH 231 Architectural Practice .....			3
ARCH 251, ARCH 252 Architectural Design Fundamentals .....	3	3	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
PHYS 133 General Physics .....	4		
CHEM 124 General Chemistry (B.1.a.) .....			4

## 124 Architectural Engineering

	F	W	S
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.)		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4)			4
HIST 204 Growth of American Democracy (D.1.)	3		
POLS 210 American and California Government (D.1.)		3	
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.)			3
	17	18	18
<b>Junior</b>			
ARCE 302 Structural Analysis II	3		
ARCE 303 Steel Design		3	
ARCE 304 Timber Design			3
ARCE 305 Masonry Design			2
ARCE 306 Matrix Analysis of Structures		3	
ARCE 361 Structural Computing Laboratory	3		
ARCE 362 Structural Systems Laboratory		3	
ARCE 363 Steel Design Laboratory			3
ARCE 415 Concrete Testing Laboratory			1
ARCE 421 Soil Mechanics			3
ARCH 317/ARCH 318/ARCH 319 elective (C.3.)			2
EE 201 Electrical Circuit Theory	3		
ME 302 Thermodynamics		3	
CSC 331 Numerical Linear Analysis	3		
GEOL 201 Physical Geology		3	
<sup>2</sup> Life sciences elective (B.1.b.)	3		
<sup>2</sup> Critical reading elective (C.1.)	3	3	
<sup>2</sup> Literature, philosophy, arts elective (C.3.) (300 level)			4
	18	18	18
<b>Senior</b>			
ARCE 225 Dynamics	3		
ARCE 422 Foundation Design	3		
ARCE 433 Economic Analysis for Engineers	2		
ARCE 444 Reinforced Concrete Design	4		
ARCE 445 Prestressed Concrete Design		4	
ARCE 446 Advanced Structural Systems			3
ARCE 451 Timber and Masonry Design Laboratory	3		
ARCE 452 Reinforced Concrete Design Laboratory		3	
ARCE 453 Projects Laboratory			3
ARCE 481 Structural Models Laboratory		1	
ARCE 482 Seismic Laboratory			1
ARCE 483 Seismic Design		3	
Approved technical electives		3	3
ME 341 Fluid Mechanics		3	
HIST 315 Modern World History (D.2.)	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.)			3
ANT 201/GEOG 150/SOC 105 elective (D.4.)			3
	18	17	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architectural Engineering and other subjects.

<sup>1</sup> Any course listed under Distribution Area E2 may be substituted for PE 250.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.) Distribution Area C3 must include at least one course from ARCH 317, ARCH 318, or ARCH 319 and additional 4 units must be 300-400 level.

## ARCHITECTURE DEPARTMENT

Department Head (Interim), Donald J. Koberg

Joseph C. Amanzio	Donna Duerk	Larry H. Loh
Robert F. Asbury, Jr.	Merrill C. Gaines	Willard L. McGonagill
Sharad D. Atre	Donald P. Grant	Sixto E. Moreira
James R. Bagnall	Kenneth L. Haggard	Paul R. Neel
Ronald E. Batterson	Terry C. Hargrave	Raymond E. Nordquist
George M. Baumgarten	John E. Harrigan, Jr.	Jens G. Pohl
David A. Brodie	George Hasslein	Charles W. Quinlan
William H. Brown	Patrick D. Hill	Marcel Sedletzky
Joseph B. Burton	George K. Ikenoyama	Arthur H. Silvers
Arthur J. Chapman	Brian B. Kesner	Vern Swansen
Allan R. Cooper	Ken Kohlen	Don E. Swearingen
M. Polly Cooper	Sandra D. Lakeman	Paul M. Wolff
Mustafa B. Denel	John H. Lange	

The objective of the five-year Bachelor of Architecture degree is to develop design and related skills necessary for entry into the professional field of architecture. Preparation for architecture spans several disciplines and requires a range of aptitudes. As the architect has a responsibility for solving problems of the built environment involving people, an understanding and sensitivity to human needs is required. Therefore, programs in architecture are broad in nature. With careful selection of elective work, areas of specialization can be included. Both the Bachelor of Architecture and the Master of Architecture degrees are accredited by the National Architectural Accrediting Board.

### CURRICULUM IN ARCHITECTURE

1st Year		F	W	S
EDES 101	Introduction to Architecture and Environmental Design	2		
EDES 110	Descriptive Drawing .....		1	1
EDES 111	Introduction to Drawing and Perspective .....	3		
EDES 112	Basic Graphics .....		3	
ARCH 102, ARCH 103	Environmental Design Fundamentals .....		2	2
ARCH 106	Materials of Construction .....			3
MATH 141, MATH 142	Analytic Geometry and Calculus (B.2.) ..	4	4	
STAT 211	Elementary Probability and Statistics (B.2.) .....			3
PHYS 131, PHYS 132	General Physics (B.1.a.) .....		4	4
AE 237	Engineering Surveying .....	2		
ENGL 114	Writing: Exposition (A.1.) .....	4		
ENGL 215	Writing: Argumentation or			
ENGL 218	Writing: Argumentation and Reports (A.4) .....			4
ENGL 125/PHIL 125/SPC 125	Critical Thinking (A.2.) .....		3	
POLS 210	American and California Government (D.1.) .....	3		
		18	17	17

	F	W	S
<b>2nd Year</b>			
EDES 250 Computer Applications (F.1.) .....		2	
EDES 251 Digital Computer Applications .....		1	
ARCH 217, ARCH 218, ARCH 219 History of Architecture .....	2	2	2
ARCH 221 Introduction to Environmental Design Science .....			2
ARCH 231, ARCH 232 Architectural Practice .....		3	3
ARCH 251, ARCH 252, ARCH 253 Architectural Design Fundamentals .....	3	3	3
<sup>1</sup> Approved design theory elective .....	3		
<sup>1</sup> Approved design process elective .....		3	
<sup>1</sup> Approved design urban/contextual elective .....			3
Approved graphics elective .....	2		
ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 223 Structural Analysis I .....			3
PHYS 137 General Physics .....	4		
	17	17	16
<b>3rd Year</b>			
ARCH 307, ARCH 308, ARCH 309 Building Support Systems .....	2	2	2
ARCH 317, ARCH 318, ARCH 319 History of Architecture .....	2	2	2
ARCH 341, ARCH 342, ARCH 343 Architectural Practice .....	2	2	2
ARCH 351, ARCH 352, ARCH 353 Architectural Design .....	5	5	5
<sup>1</sup> Approved design graphics elective .....			2
<sup>1</sup> Approved human factors elective .....	3		
ARCE 301 Stress Analysis Laboratory .....	1		
ARCE 321 Timber Design .....	3		
ARCE 322 Steel Design .....		3	
ARCE 323 Concrete and Masonry Design .....			3
CRP 212 Introduction to Urban Planning .....		3	
	18	17	16
<b>4th Year</b>			
ARCH 407 Building Support Systems .....	2		
ARCH 441, ARCH 442, ARCH 443 Professional Practice .....	2	2	2
ARCH 451, ARCH 452, ARCH 453 Architectural Design .....	5	5	5
ARCH 463 Undergraduate Seminar .....			2
<sup>1</sup> Approved school professional electives .....		3	3
HIST 204 Growth of American Democracy (D.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
<sup>2</sup> Critical reading-English (C.1.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2	
HIST 315 Modern World History (D.2.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
	18	18	18

F W S

5th Year

ARCH 481 Architectural Design .....	5	5	5
ARCH 491, ARCH 492, ARCH 493 Design Project .....	2	2	2
<sup>1</sup> Approved school professional electives .....		3	3
<sup>2</sup> Life sciences elective (B.1.b.) .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
	16	16	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architecture and other subjects.



CURRICULUM FOR THE MASTER  
OF ARCHITECTURE DEGREE

(See the *Graduate Studies Bulletin*)

Architectural Design .....	Units
Courses at 400 and 500 level in the School of Architecture and Environmental Design .....	24
Thesis Project .....	21
Approved electives at 400 and 500 level .....	9
	18
	72

<sup>1</sup> To be selected with department approval.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

# CITY AND REGIONAL PLANNING DEPARTMENT

Department Head, William A. Howard

Linda C. Fitzpatrick  
Steven P. French

Joseph M. Kourakis  
Michael E. McDougall

Edward J. Ward

The four-year curriculum leading to a Bachelor of Science degree in City and Regional Planning develops competency in technical skills directed toward the professional field which deals with urban and regional processes. The program emphasizes comprehensive physical planning and urban design supported by courses in technical, scientific, economic, legal, administrative, and social areas.

## CURRICULUM IN CITY AND REGIONAL PLANNING

Freshman	F	W	S
EDES 101 Introduction to Architecture and Environmental Design	2		
EDES 110 Descriptive Drawing	1		
EDES 111 Introduction to Drawing and Perspective		3	
EDES 112 Basic Graphics			3
CRP 211 Introduction to Urbanization			3
MATH 118 Pre-Calculus Algebra (B.2.)		4	
MATH 121 Finite Mathematics (B.2.)			3
CSC 110 Computers and Computing (F.1.)			3
ENGL 114 Writing: Exposition (A.1.)	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)		3	
SPC 201 Public Speaking (A.3.)			3
BIO 101 General Biology (B.1.b.)	3		
ANT 201 Cultural Anthropology or			
GEOG 150 Human Geography (D.4.)	3		
HIST 204 Growth of American Democracy (D.1.)		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.)		3	
PSY 201/PSY 202 General Psychology (E.1.)	3		
PE 250 Health Education (E.2.)			2
	16	16	17
Sophomore			
EDES 201, EDES 202 Environmental Design Fundamentals	3	3	
CRP 203 Applied Design and Planning Fundamentals			3
CRP 212 Introduction to Urban Planning	3		
CRP 213 Survey Methods		3	
CRP 214 Urban and Regional Processes			3
CRP 216 Computer Applications for Planning			1
LA 213 Site and Terrain Analysis		4	
STAT 251 Statistical Inference for Management I (B.2.)	3		
ENGL 218 Writing: Argumentation and Reports (A.4.)	4		
Critical reading-English (C.1.)			3
ECON 221 Microeconomics	4		
ECON 222 Macroeconomics (D.3.)		4	
NRM 304 Ecology of Resource Areas			4
GEOL 211 Cities and Geology (B.1.a.)		3	
GEOG 250 Physical Geography			3
	17	17	17



	F	W	S
<b>Junior</b>			
CRP 314 Planning Theory .....	3		
CRP 347, CRP 348 Urban and Regional Design .....	3		3
CRP 351, CRP 352, CRP 353 Planning Laboratory .....	4	4	4
SOC 313 Urban Sociology .....	3		
POLS 210 American and California Government (D.1.) .....		3	
POLS 403 Municipal Government .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
<sup>1</sup> Physical or life sciences elective (B.1.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>2</sup> Approved electives .....		3	3
	16	16	16



<b>Senior</b>			
CRP 409 Planning Internship .....			2
CRP 420 Planning Law .....	3		
CRP 430 Planning Administration .....		3	
CRP 447 Urban and Regional Design or			
CRP 452 Planning Lab .....		5	
CRP 451, CRP 453 Planning Lab .....	5		5
CRP 461, CRP 462 Senior Project .....		2	2
PSY 401 Social Psychology .....	3		
ANT 360/ECON 304/GEOG 308 (D.4.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
PHIL 315, PHIL 331, or PHIL 333 Philosophy elective (C.3.) .....	3		
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>2</sup> Approved electives .....		3	3
Elective .....			2
	17	16	17

<sup>1</sup> To be selected in accordance with General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected with adviser approval and to include 9 units of CRP courses.

## CURRICULUM FOR THE MASTER OF CITY AND REGIONAL PLANNING DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

Prerequisite courses, or equivalents, are to be completed before the student is accepted into classified status. Students with deficiencies may be admitted as conditionally classified. Units do not apply to total required for degree.

STAT 251 Statistical Inference for Management I

CSC 110 Computers and Computing

ECON 221 Microeconomics or ECON 434 Urban Economics

BIO 325 General Ecology or NRM 304 Ecology of Resources

## Core courses:

CRP 409 Planning Internship .....	2	
CRP 420 Planning Law .....	3	
CRP 430 Planning Administration .....	3	
CRP 501, CRP 502 Foundations of Urban and Regional Planning .....	4, 4	
CRP 510 Planning Theory .....	4	
CRP 513 Survey and Research Methods.....	3	
CRP 515 Graphic Communications .....	3	
CRP 516 Quantitative Methods .....	4	
CRP 520 Feasibility Studies in Planning .....	3	
CRP 525 Planning Implementation .....	4	
CRP 552, CRP 553 Planning Laboratory .....	4, 4	
CRP 554 Advanced Planning Laboratory .....	4	
CRP 599 Thesis/Project .....	6	
		55
Approved specialization .....	12	
Approved electives .....	9	
Total units .....		76

See COURSES OF INSTRUCTION section of this catalog for description of courses in City and Regional Planning and other subjects.

## CONSTRUCTION MANAGEMENT DEPARTMENT

Department Head, David R. Pierce, Jr.

James A. Rodger

Helmut I. Schleicher

Matthias R. Wall

The four-year program in Construction Management leads to the Bachelor of Science degree which is accredited the American Council for Construction Education. Major emphasis is placed on organizing and managing the construction phase of society's efforts to improve the environment. The constructor is an important member of the building team and requires a professional knowledge of techniques, materials, equipment, job planning and cost control to add to the contributions of the planning and design professions. Graduates of this program can help supply the urgent needs of the construction industry and its related fields.

### CURRICULUM IN CONSTRUCTION MANAGEMENT

Freshman	F	W	S
EDES 101 Introduction to Architecture and Environmental Design .....	2		
ARCH 106 Materials of Construction .....			3
ARCH 121 Introduction to Architectural Graphics .....		3	
MATH 141, MATH 142 Analytic Geometry and Calculus (B.2.) ..	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
AE 237 Engineering Surveying .....	2		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
POLS 210 American and California Government (D.1.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b. and E.2.) ....			4
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
	15	17	17
Sophomore			
ARCH 208, ARCH 209 Architectural Design Basics .....	2	2	
ARCH 231, ARCH 232 Architectural Practice .....	3	3	
ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 223 Structural Analysis I .....			3
CRP 212 Introduction to Urban Planning .....		3	
LA 213 Site and Terrain Analysis .....			3
PHYS 137 General Physics: Applied Physics for Architects .....	4		
BUS 201 Business Law Survey .....	3		
ECON 201 Survey of Economics (D.3.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
ENGL 310 Corporate Communication .....			4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
	15	18	16

# 132 Construction Management

	F	W	S
<b>Junior</b>			
EDES 250 Computer Applications (F.1.) .....		2	
CM 321 Concrete Technology .....			3
CM 331 Construction Cost Control .....	3		
CM 332 Cost Alternatives Evaluation.....		4	
CM 333 Construction Contract Administration.....			3
CM 341 Wood and Masonry Construction Practices .....	4		
CM 342 Concrete and Formwork Construction Practices.....		4	
CM 343 Steel and Earthwork Construction Practices .....			4
CM 351, CM 352, CM 353 Building Support System Construction Practices .....	3	3	3
ARCE 301 Stress Analysis Laboratory.....	1		
ARCE 321 Timber Design .....	3		
ARCE 322 Steel Design .....		3	
ARCE 323 Concrete and Masonry Design .....			3
HIST 315 Modern World History (D.2.) .....	3		
	<u>17</u>	<u>16</u>	<u>16</u>
<b>Senior</b>			
CM 441 Heavy and Civil Works Construction Practices.....	3		
CM 442 Building Estimating .....		2	
CM 443 Principles of Construction Management .....			3
CM 451 Industrial and Process Construction .....	4		
CM 452 Project Controls .....		4	
CM 453 Project Development.....			4
CM 461, CM 462 Senior Project .....	2	1	
ARCE 409 Survey of Foundation Engineering .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
GEOL 201 Physical Geology (B.1.a.) .....	3		
MGT 316 Labor Contract Administration .....		4	
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3		3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
	<u>18</u>	<u>17</u>	<u>16</u>

See COURSES OF INSTRUCTION section of this catalog for description of courses in Construction Management and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

## LANDSCAPE ARCHITECTURE DEPARTMENT

Department Head, Gerald L. Smith

Gary C. Dwyer  
John F. Gillham  
Alice C. Loh

Roger J. Osbaldeston  
Dale A. Sutliff

Walter M. Tryon  
K. Richard Zweifel

The four-year program for a Bachelor of Science degree in Landscape Architecture is recognized by the California State Board of Landscape Architects and is accredited by the American Society of Landscape Architects. Emphasis is placed on the design and functional organization of open space and the conservation and revitalization of both the natural and urban landscapes. These range in scope from small project units to systems of urban, rural, and regional scale. Complementary course work develops the additional tools and skills that are necessary for a project to be realized in built form. Graduates of the program will be prepared for entry level positions in the private and public practice of landscape architecture as well as graduate study at the master's level.



### CURRICULUM IN LANDSCAPE ARCHITECTURE

#### Freshman

	F	W	S
EDES 101 Introduction to Architecture and Environmental Design	2		
EDES 112 Basic Graphics			3
LA 110 Graphic Communication for Landscape Architects		3	
LA 152 Orientation to Design and Planning in Landscape Architecture		4	
MATH 120 College Algebra and Trigonometry (B.2.)	5		
<sup>1</sup> Mathematics or statistics elective (B.2.)			3
CSC 110 Computers and Computing (F.1.)			3
ENGL 114 Writing: Exposition (A.1.)	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.)			3
BOT 121 General Botany (B.1.b.)		4	
POLS 210 American and California Government (D.1.)	3		
HIST 204 Growth of American Democracy (D.1.)			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.)	3		
<sup>1</sup> Physical sciences elective (B.1.a.)		3	
PSY 201/PSY 202 General Psychology (E.1.)			3
	17	17	18

## 134 Landscape Architecture

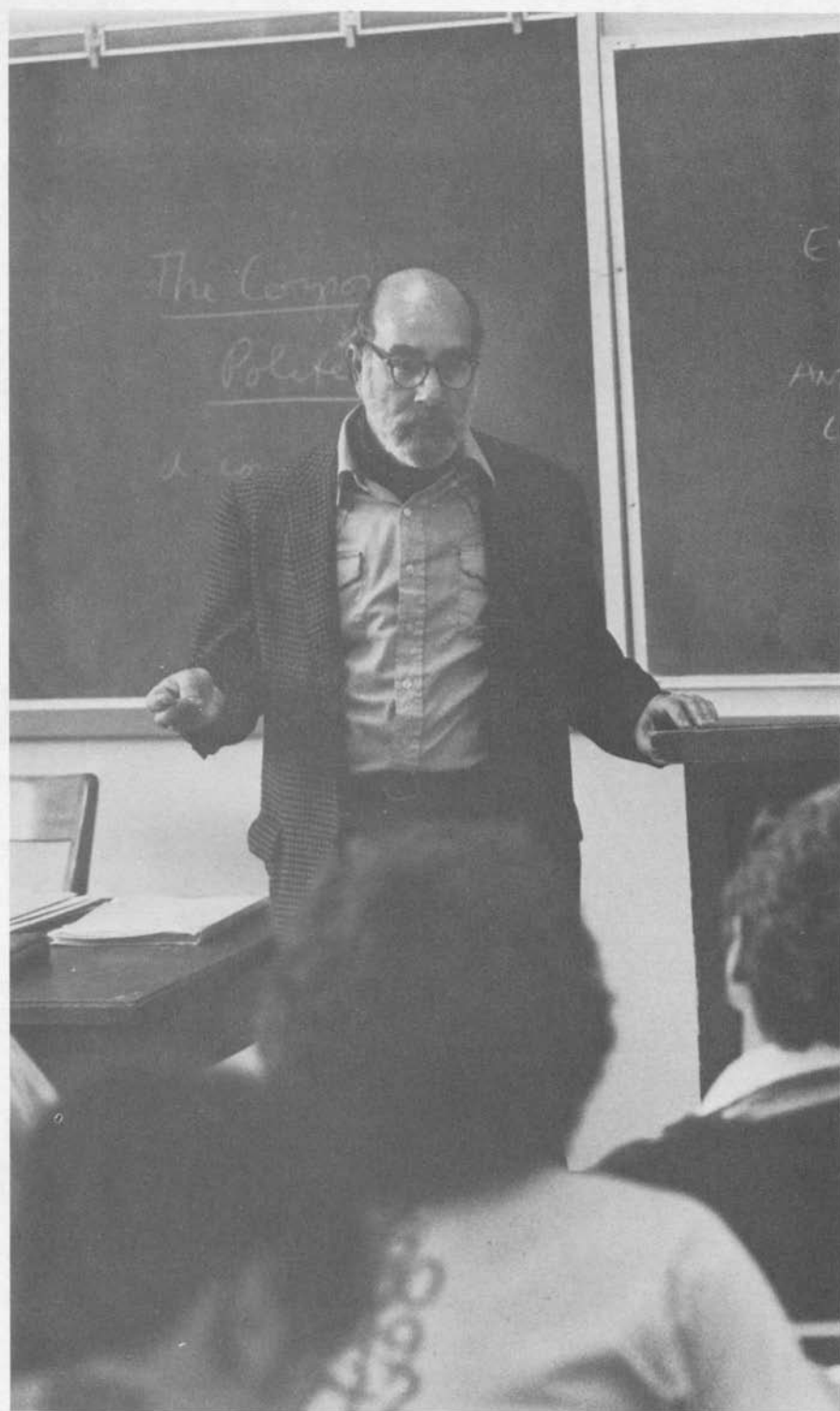
	F	W	S
<b>Sophomore</b>			
EDES 201, EDES 202 Environmental Design Fundamentals .....	3	3	
LA 203 Applied Design and Planning Fundamentals .....			3
LA 213 Site and Terrain Analysis .....		4	
LA 231 Landscape Architecture Construction .....			3
LA 311 History of Landscape Architecture .....	3		
LA 321 Concepts in Environmental Decision Making .....			3
ARCE 311 Structures for Landscape Architects .....		3	
OH 237, OH 238, OH 239 Landscape Plants I, II, III .....	3	3	3
AE 237 Engineering Surveying .....	2		
SS 121 Soils .....		4	
BOT 238 Native Plant Materials .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
<sup>1</sup> Critical reading elective (C.1.) .....			3
ANT 360 Human Cultural Adaptation (D.4.) .....	3		
	18	17	18
<b>Junior</b>			
LA 310 Introduction to Computing in Planning and Design .....	2		
LA 341, LA 342, LA 343 Landscape Architecture Construction .....	3	3	3
LA 347 Landscape Plant Composition .....	3		
LA 348 Advanced Landscape Plant Composition .....			3
LA 351, LA 352, LA 353 Design for Landscape Architects .....	4	4	4
LA 441 Professional Practice .....			2
CM 325 Construction Management Practices .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
ANT 201/GEOG 150/SOC 105 (D.4.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PHIL 331 Ethics (C.3.) .....		3	
	15	16	15
<b>Senior</b>			
LA 410 Information Systems in Landscape Architecture .....	2		
LA 442 Professional Practice .....	2		
LA 451, LA 452 Design for Landscape Architects .....	5	5	
LA 453 Advanced Landscape Architecture Design .....			5
LA 461 Senior Project .....	3		
LA 463 Undergraduate Seminar .....		2	
<sup>2</sup> Landscape Architecture Department elective .....		3	
CRP 212 Introduction to Urban Planning .....	3		
<sup>2</sup> Approved technical elective .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
<sup>1</sup> Physical or life sciences elective (B.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
	15	16	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Landscape Architecture and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected with adviser approval.







# School of Business

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# SCHOOL OF BUSINESS

Kenneth D. Walters, Dean  
M. Zafar Iqbal, Associate Dean

The primary objective of the School of Business is education for business administration. The School of Business seeks to equip its majors with basic knowledge, analytical skills, and attitudes essential to employment in business, government, and other responsible positions in our society, and to serve students throughout the University by providing them with an understanding of the business and economic world in which they live.

To achieve these goals, the School is organized into four departments—Accounting, Business Administration, Economics, and Management. This organization recognizes that education for business requires the interaction of business specialists with faculty in supporting disciplines to provide ability to function in the socio-economic environment in which business exists.

The School offers programs leading to degrees of Bachelor of Science in Business Administration, Master of Business Administration, and Bachelor of Science in Economics. A pre-law advisement service is available to all University students.

The School's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through career-oriented study, special projects, and internships. Educational programs are designed to help the student achieve maximum personal development, to prepare the student for entry into the business world, and to foster citizenship, leadership, and constructive community living. The curriculum includes general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

## MASTER OF BUSINESS ADMINISTRATION

### General Characteristics

The Cal Poly MBA program is designed to prepare students for careers in all phases of management. The program is broad in nature, requiring advanced study and research in most business disciplines. In addition, elective courses allow each student to specialize in one of those disciplines. The program is intended for full-time students from a variety of undergraduate backgrounds. The primary goals of the program can be described as follows:

- 1) To provide an integrated understanding of the principles of the various business disciplines. Besides mastering the principles of the individual disciplines, the ability to integrate those principles is an essential characteristic of successful managers. Cal Poly's approach to MBA education is purposely aimed at fostering this integrated understanding.
- 2) To develop an expertise in assembling and analyzing relevant facts as a basis for significant business decisions. The student will learn analytical, planning and forecasting skills to provide a basis for effective managerial decisions as firms adapt to their changing environment.
- 3) To promote the ability to work with other people through an understanding of human values, motivations, and organizational structures. The student will understand the essential elements of interpersonal relations, individual and group behavior, and the design of effective organizations.

### Prerequisites

There are no specific prerequisite courses for the MBA program. For those students without a strong background in quantitative subjects, the program has one more required class and one less elective class (five instead of six).

Admission to the MBA program is based upon:

- a) the student's undergraduate record, emphasizing most heavily the last 90 quarter units;
- b) achievement on the Graduate Management Admission Test (GMAT); and
- c) management potential as evidenced by previous work experience, community or college extracurricular activities, and evaluations by professors and/or supervisors.

For more information on the MBA Program and for application materials specific to the program, the interested student should communicate with the Coordinator of the MBA Program.

### Program of Study

The MBA program entails a two-year program of graduate work commencing in the fall quarter of each year. The purpose of the first year is to build a broad understanding of the concepts and principles of the field of business administration. At the end of the first year the student should have a firm knowledge of current business practices. In addition, the first year courses stress the fundamental theoretical concepts of the various business fields. The second year curriculum provides the student with advanced work in interpersonal and organizational skills and also in planning and forecasting skills. In addition, about half the second year classes are elective classes, which allows students to take classes in their areas of interest.

### Agribusiness Specialization

This specialization is offered in conjunction with the Agricultural Management Department. It requires the completion of six graduate courses taught by the Agricultural Management Department. These courses are taken in lieu of the electives in the second year of the MBA program. The MBA Agribusiness specialization is designed for those interested in agribusiness management careers. Graduates will be prepared for large farm and ranch management as well as for positions in supporting agribusiness industries such as commodity marketing or food processing.

## CURRICULUM FOR THE MASTER OF BUSINESS ADMINISTRATION

(For University requirements see the *Graduate Studies Bulletin*)

First Year		F	W	S
GSB 511	Financial Accounting .....	4		
<sup>1</sup> GSB 512	Foundations for Quantitative Analysis .....	4		
GSB 513	Organizations and Management .....	4		
GSB 514	Management in an International Environment .....	4		
GSB 521	Accounting for Management Planning and Control .....		4	
GSB 522	Quantitative Business Analysis I .....		4	
GSB 523	Managerial Economics .....		4	
GSB 524	Marketing Management .....		4	
GSB 531	Managerial Finance .....			4
GSB 532	Quantitative Business Analysis II .....			4
GSB 533	Aggregate Economic Analysis and Policy .....			4
GSB 534	Operations Management .....			4
		16	16	16
Second Year				
GSB 541	Organizational Behavior .....	4		
GSB 542	Marketing Research and Planning .....	4		
<sup>1</sup> GSB 543	Business, Government, and Society .....	4		
GSB 551	Organization Analysis, Planning and Decision Making .....		4	
GSB 552	Financial Analysis and Planning .....		4	
GSB 561	Organizational Change and Development .....			4
GSB 562	Business Strategy and Policy .....			4
Electives	.....	4	8	8
		16	16	16

<sup>1</sup> Students with strong quantitative (mathematics and statistics) backgrounds can be exempt from GSB 512 Foundations for Quantitative Analysis. They should take GSB 543 Business, Government, and Society in the fall quarter of their first year and an additional elective in the fall quarter of their second year.

### AGRIBUSINESS SPECIALIZATION

Add courses below in place of electives in MBA Program: *Units*

AM 544	Advanced Farm and Ranch Management.....	(4)
AM 553	Agricultural Policy and Program Analysis .....	(4)
AM 554	Managing Price Risk in Agribusiness .....	(4)
AM 563	Agricultural Trade and Market Development.....	(4)
AM 564	Agribusiness Managerial Leadership and Communication.....	(4)
AG 539	Graduate Internship in Agriculture or	
AG 500	Individual Study .....	(4)

Agribusiness specialization students taking GSB 512 will substitute an Agricultural Management course for one of the other second year MBA courses. The deviated course will be determined by the MBA Coordinator depending on the academic strengths of the individual student.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graduate Studies in Business (GSB).



## ACCOUNTING DEPARTMENT

Department Head, Richard J. Schmidt

Charles T. Andrews  
Lawrence E. Baur, Jr.  
Wallace H. Burt

Robert W. Hill  
M. Zafar Iqbal

Harold R. Miller  
David E. Nutter

The primary objectives of the Accounting Department are to: 1) provide students within the School of Business with a knowledge of the accounting information and systems relevant to business decisions; 2) prepare students for careers as professional accountants; 3) provide a service to other students from other schools within the University with an introduction to accounting and its uses.

### CURRICULUM IN ACCOUNTING

Freshman	F	W	S
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab) (B.1.) ....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	16	15	16
<b>Sophomore</b>			
ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 Growth of American Democracy (D.1.) .....			3
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....		3	
	18	17	16

	F	W	S
<b>Junior</b>			
MGT 314 Human Resources Management .....		4	
MGT 317 Organizational Behavior .....			4
ACTG 301 Managerial Accounting .....	4		
FIN 342 Financial Management .....		4	
MKTG 301 Principles of Marketing .....	4		
MGT 312 Organization and Management Theory .....	4		
MGT 321 Application of Information Processing and Quantitative Business Analysis .....			4
MGT 325 Production and Operations Management .....			4
ECON 337 Money, Banking and Credit .....		4	
<sup>2</sup> Electives and courses to complete major .....	4	4	4
	16	16	16
<b>Senior</b>			
HIST 315 Modern World History (D.2.) .....	3		
MGT 414 Business Strategy and Policy Seminar .....			4
ACTG 461, ACTG 462 Senior Project .....		2	2
BUS 404 Governmental and Social Influences on Business .....	4		
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>3</sup> ANT/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>2</sup> Electives and courses to complete major .....	10	10	11
	17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> 27 to 29 units of concentration electives must be chosen with approval of adviser.

<sup>3</sup> Must be 300-400 level course in accordance with General Education-Breadth requirements. (See adviser or Advisement Center.)



## BUSINESS ADMINISTRATION DEPARTMENT

Department Head, Walter W. Perlick

Gary J. Bamossy  
Dan Bertozzi, Jr.  
Lee B. Burgunder  
James M. Buxbaum

D. Jan Duffy  
John R. Lindvall  
Michael S. Noble  
Eugene L. O'Connor

Kenneth D. Riener  
Stanley B. Smith  
Richard R. Still

The Department offers an undergraduate program leading to the Bachelor of Science degree in Business Administration with concentrations available in Financial Management and Marketing Management.

The objective of the Business Administration Department is to provide a level of education that will qualify graduates for entry-level positions in the fields of Marketing, and/or Finance. Within the concentrations, there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter uniquely suited for the student's occupational goal.

The Department provides service courses to many departments of the University, notably in Business Law and Public Policy. The department also provides major staff support for the Master's degree program in Business Administration. See Master of Business Administration for details of this program.

### CURRICULAR CONCENTRATIONS

#### Financial Management

This concentration provides both depth of exposure in finance as well as breadth of exposure to related fields for students interested in careers in finance. Students are exposed to specialized course work in corporate finance, investments, real estate, and financial markets. In addition, course work in computer science, management information systems, accounting, and economics is encouraged to provide broader familiarity with these important "tool" areas of finance. Successful graduates are much in demand for positions in banking, corporate financial planning areas, real estate, and many other business areas.

#### Marketing Management

The Marketing Management concentration emphasizes course work in all of the many areas traditionally covered in the marketing function. These areas include marketing research, sales management, physical distribution, promotion, and buyer behavior. As with the Financial Management concentration, students in Marketing Management are encouraged to take course work in other fields that have special importance to the student's career objective. Graduates of this concentration are in strong demand by a number of businesses, both profit and non-profit, for a wide variety of occupations.

### CURRICULUM IN BUSINESS ADMINISTRATION

Freshman	F	W	S
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading-English (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab) (B.1.) ....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	<hr/> 16	<hr/> 15	<hr/> 16

	F	W	S
<b>Sophomore</b>			
ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 Growth of American Democracy (D.1.) .....			3
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
Electives and courses to complete major .....		3	
	18	17	16
<b>Junior</b>			
MGT 314 Human Resources Management .....		4	
MGT 317 Organizational Behavior .....			4
ACTG 301 Managerial Accounting .....	4		
FIN 342 Financial Management .....		4	
MKTG 301 Principles of Marketing .....	4		
MGT 312 Organization and Management Theory .....			4
MGT 321 Application of Information Processing and Quantitative Business Analysis .....		4	
MGT 325 Production and Operations Management .....			4
ECON 337 Money, Banking, and Credit .....	4		
<sup>2</sup> Electives and courses to complete major .....	4	4	4
	16	16	16
<b>Senior</b>			
HIST 315 Modern World History (D.2.) .....	3		
<sup>3</sup> ANT/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
MGT 414 Business Strategy and Policy Seminar .....			4
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....		3	
BUS 461, BUS 462 Senior Project .....		2	2
BUS 404 Government and Social Influences on Business .....	4		
<sup>2</sup> Electives and courses to complete major .....	10	10	11
	17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> 27 to 29 units of concentration electives must be chosen with approval of adviser.

<sup>3</sup> Must be upper division course in accordance with General Education-Breadth requirements. See adviser or advisement center.



## ECONOMICS DEPARTMENT

Department Head, George M. Eastham

John P. Adams, Jr.	Artemis Papakyriazis	Alden F. Shiers
George L. Beardsley, Jr.	Panagiotis Papakyriazis	Fuad H. Tellev
Michael W. Johnson	Dominic B. Perello	Daniel P. Williamson
Timothy W. Kersten	Walter E. Rice	

The Economics Department has two broad purposes: it serves all schools of the campus by offering courses which will help students to understand the overall functioning of the American economy; and secondly, it offers an undergraduate program leading to the Bachelor of Science Degree in Economics.

The Economics degree program will prepare students for employment in business and government as economists, analysts and general managers. The teaching of economics in high school is another occupational field for the economist. Finally, the program will prepare students to undertake graduate study in economics, law, business administration and related fields in the social sciences.

### CURRICULAR CONCENTRATIONS

Economics majors may take any concentration offered by the School of Business or the Political Science or Social Sciences departments in lieu of the economics concentrations described below, provided appropriate prerequisites are satisfied.

#### Business and Industrial Economics

The Business and Industrial Economics concentration, designed for those students who intend to seek business and industrial application of the economics discipline, provides a balanced program of economic and business theory and application.

#### International Trade and Development

This concentration provides a core of trade and development theory, plus study in ancillary elective fields that meet the occupational needs of students. It is designed for those students interested in working in an international area in the public or private sectors.

#### Quantitative Economics

This concentration will offer a combination of mathematics, statistics, and quantitative economics courses. As a unit they are designed to provide the graduate with a background adequate for employment in a variety of business and other situations where the economic decision makers rely on the precision of the mathematician's tools, or for entrance to graduate study in such fields as economics, business administration, or operations research.

### CURRICULUM IN ECONOMICS

Freshman	F	W	S
ECON 105 Consumer Economics .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
CSC 120 Principles of Business Data Processing (F.1.) .....		4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
POLS 210 American and California Government (D.1.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
<sup>1</sup> Life and physical Science electives (one each, one with lab) (B.1.) ....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Technology elective (F.2.) .....			2
	17	17	17

	F	W	S
<b>Sophomore</b>			
BUS 201 Business Law Survey .....			3
ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
<sup>2</sup> MATH 221 Calculus for Business and Economics (B.2.) .....	4		
<sup>2</sup> MATH 222 Math Analysis for Economics and Business (B.2.) .....		4	
HIST 204 Growth of American Democracy (D.1.) .....	3		
<sup>2</sup> STAT 251 Statistical Inference for Management I (B.2.) .....		3	
<sup>2</sup> STAT 252 Statistical Inference for Management II .....			3
ENGL 215 Writing: Argumentation (A.4.) .....		4	
PHIL 221 Traditional Logic or			
PHIL 222 Modern Logic (C.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
Electives .....			4
	17	18	16
<b>Junior</b>			
ECON 311, ECON 312 Intermediate Microeconomics and			
ECON 313 Macroeconomics .....	4	4	4
HIST 315 Modern World History (D.2.) .....	3		
GEOG 315 Geography of Resource Utilization .....			3
ECON 304 Comparative Economic Systems .....		3	
ECON 324 American Economic History .....			3
ECON 337 Money, Banking and Credit .....	4		
<sup>1</sup> ANT/BUS/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>3</sup> Electives and courses to complete major .....	5	6	6
	16	16	16
<b>Senior</b>			
<sup>1</sup> Critical reading elective (C.1.) .....			3
ECON 410 Cost-Benefit Analysis .....	4		
ECON 314 Monetary and Fiscal Policy .....	4		
ECON 317 Development of Economic Analysis .....		3	
ECON 461, ECON 462 Senior Project .....	2	2	
ECON 463 Undergraduate Seminar .....			2
<sup>3</sup> Electives and courses to complete major .....	6	11	11
	16	16	16

See COURSES OF INSTRUCTIONS section of this catalog for descriptions of courses in Economics and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> Students in the Quantitative Concentration take MATH 141, MATH 142, MATH 143, and STAT 321, STAT 322 in lieu of these courses.

<sup>3</sup> 18 to 20 units to be selected in a field of concentration.

## MANAGEMENT DEPARTMENT

Department Head, Robert H. McIntire

Melvin W. Aussieker, Jr.

Milton Drandell

Abraham B. Shani

Allan S. Baillie

Eldon Y. Li

Michael W. Stebbins

H. Kenneth Bobele

Ernest C. Miller

Donald A. Yale

Robert K. Coe

Rolf E. Rogers

Paul Zivkovich

The objectives of the Management Department are to provide knowledge and skills of modern management theory and practice through the study of subjects critical to management performance (including general management, human resources management, international management, management information systems, and production and operations management); to develop in the student knowledge and skills of a second area or function to facilitate initial employment and subsequent career development; to help the student to acquire an appreciation of cultural, economic, political and technological trends which affect the role of managers in contemporary society; to help professionally oriented students use theories, concepts, research findings, problem-solving techniques, and analytical skills in management situations; and to provide a broad background and generalist viewpoint by encouraging study of individual courses in several knowledge and skill areas (including labor, economics, and social and political science).

The degree awarded is the Bachelor of Science in Business Administration with concentrations in Human Resources Management, International Business Management, Management, Management Information Systems, and Production and Operations Management.

### CURRICULAR CONCENTRATIONS

#### Human Resources Management

The two areas of interest within this concentration relate to labor-management relations and personnel management. Students learn how to perform the functions of recruitment, selection, development, compensation, contract negotiations, and administration.

#### International Business Management

This concentration is designed to provide the student the opportunity to develop proficiency in the subject matter basic to an occupational goal in the management of international/multinational operations. It provides cultural understanding, organizational knowledge and analytical skill central to international business management.

#### Management

This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

#### Management Information Systems

This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

#### Production and Operations Management

This concentration prepares students for careers in production and operations management with business or service organizations. It provides training in purchasing; cost, quality, and inventory control; materials planning; and other production or operations management functions.

## CURRICULUM IN MANAGEMENT

Freshman	F	W	S
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab) (B.1.) ....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	<hr/> 16	<hr/> 15	<hr/> 16



	F	W	S
<b>Sophomore</b>			
ECON 221 Microeconomics and			
ECON 222 Macroeconomics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 American Democracy and World Affairs (D.1.) .....			3
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....		3	
	18	17	16
<b>Junior</b>			
MGT 314 Human Resources Management .....	4		
MGT 317 Organizational Behavior .....			4
ACTG 301 Managerial Accounting .....	4		
FIN 342 Financial Management .....		4	
MKTG 301 Principles of Marketing .....	4		
MGT 312 Organization and Management Theory .....	4		
ECON 337 Money, Banking and Credit .....		4	
MGT 321 Application of Information Processing and Quantitative Business Analysis .....		4	
MGT 325 Production and Operations Management .....			4
<sup>2</sup> Electives and courses to complete major .....		4	8
	16	16	16
<b>Senior</b>			
HIST 315 Modern World History (D.2.) .....	3		
MGT 414 Business Strategy and Policy Seminar .....			4
MGT 461, MGT 462 Senior Project .....		2	2
BUS 404 Government and Social Influences on Business .....	4		
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>3</sup> ANT/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>2</sup> Electives and courses to complete major .....	10	10	11
	17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> 27 to 29 units of concentration electives must be chosen with the approval of adviser.

<sup>3</sup> Must be upper division course selected in accordance with General Education-Breadth requirements. See adviser or advisement center.



# School of Communicative Arts and Humanities

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## SCHOOL OF COMMUNICATIVE ARTS AND HUMANITIES

Jon M. Ericson, Dean  
Thomas V. Johnston, Associate Dean

The School of Communicative Arts and Humanities provides a record of man's experience and potential as a creative, imaginative, and reflective being. The School seeks to relate itself to the technological disciplines in a way that will help contribute to the solution of human problems. Accordingly, a wide range of courses is offered to serve every thoughtful man and woman without regard to specialized professional interests.

The School includes disciplines which represent four broad areas of knowledge: the fine and performing arts, communications, humanities, and social sciences. While the School has unusual breadth and diversity, unity is found in a study of the most engaging subject of all . . . man. Whether the focus is on imaginative man, political man, creative man, or rational man, there is a settled purpose: to help each student know herself or himself, to understand human values and human potential, and to understand our society and its institutions.

The eleven departments represented in the School are these: Art, English, Foreign Languages, Graphic Communications, History, Journalism, Music, Philosophy, Political Science, Social Sciences, and Speech Communication. Bachelor's degree programs are offered in each department except Foreign Languages, Music, and Philosophy. Academic minors are offered in these latter three departments as well as in English, Public Administration, and Speech Communication. The English Department offers a Master of Arts degree.

Departmental offerings are supplemented by courses designated as Humanities. These courses, offered under the direction of a Humanities Coordinator, aim to heighten the student's sense of the interdisciplinary nature of humanistic studies and to increase awareness of humanistic values.

In addition to extensive involvement in the instructional program, the School has a major responsibility for activities which enhance the cultural and intellectual environment of the campus. Active programs of exhibits and concerts are carried on in music and art, and a full range of dramatic production is staged in the theatre. Students with other talents are attracted to the School's cocurricular programs such as KCPR Radio, *Mustang Daily*, Model United Nations, Foreign Languages Club, creative writing contests, or intercollegiate forensics and debate. In addition, the School regularly sponsors an Arts and Humanities Lecture Series, and has recently initiated a similar series with a focus on political science.



## ART DEPARTMENT

Department Head, Barbara Young

Robert S. Densham  
Keith W. Dills  
Bernard W. Dusek  
Clarissa Hewitt  
Robert Howell

Charles W. Jennings  
Eric B. Johnson  
Helen P. Kelley  
John P. Mendenhall

Daniel D. Piel  
Pierre C. Rademaker  
Robert G. Reynolds  
Henry Wessels

The Art Department offers a four-year curriculum leading to the Bachelor of Science degree in Applied Art and Design. The curriculum prepares students for professional participation in the fields of graphic design or photography.

Graphic design students are prepared for professional careers in advertising design, editorial design, corporate identity, and related areas. The curriculum emphasizes creative problem-solving, and addresses the development of specific skills in the design, layout, and execution of graphic problems with supportive knowledge of reproduction limitations. Graphic design students have the unique opportunity, through course offerings in photography and graphic communications, to gain practical experience in production methods.

The photography option is a diversified, professionally oriented program in applied photography. Through these courses students gain expertise in technique, creativity, documentation and aesthetics in black and white and color photography. Visual literacy and problem-solving in photographic illustration/design are emphasized. Studies progress through a series of courses from basic photography to advanced commercial/illustration, utilizing large and small format cameras, color theory, electronic color analysis in color printing, studio speedlights, and multi-media production. The program also includes a study of the history of photography and the current photography marketplace.

Both the graphic design and photographic options support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment.

The Department recognizes that art and design are increasingly relevant to many professional fields. Accordingly, art prefix courses are frequently required within various university majors and the Art Department provides this service through a strong and diversified program.

In addition to the major and support programs, general education courses are available for all students who wish to enrich their understanding, appreciation, and practical skills in the areas offered within the Art Department.

### CURRICULUM IN APPLIED ART AND DESIGN

Freshman	F	W	S
ART 101 Fundamentals of Drawing .....	3		
ART 131, ART 132, ART 133 Design Fundamentals .....	3	3	3
ART 211 Art History: Prehistoric through the Middle Ages .....			4
<sup>1</sup> ART 201 Intermediate Drawing or			
ART 222 35mm Intermediate Photography .....		3	
ART 221 Basic B/W Photography .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....		4	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>2</sup> Life sciences elective (B.1.b.) .....	4		
<sup>2</sup> Physical sciences elective (B.1.a.) .....		4	
<sup>2</sup> Physical or life sciences elective (with laboratory) (B.1.) .....			4
<sup>2</sup> Mathematics elective (B.2.) .....	3		
Elective .....		3	
	16	17	17

Sophomore		F	W	S
ART 134	3-Dimensional Design .....		3	
ART 208	Sculpture .....			3
ART 212	Art History: Renaissance through the Baroque Era .....	4		
ART 213	Art History: European 18th and 19th Century Art .....		4	
ART 224	35mm Advanced B/W Photography .....			3
ART 228	35mm Color Slide Photography .....			2
MKTG 204	Elements of Marketing or			
BUS 207	Business Law .....		4	
HIST 204	Growth of American Democracy (D.1.) .....		3	
<sup>1</sup> GRC 122	Design with Type or			
GRC 227	Process Camera .....	5		
ENGL 218	Writing: Argumentation and Reports (A.4.) .....	4		
ECON 201	Survey of Economics or			
ECON 211	Principles of Economics (D.3.) .....			3
SPC 201	Public Speaking or			
SPC 202	Principles of Speech (A.3.) .....			3
Courses to complete major .....		3	3	3
		16	17	17
Junior				
ART 311	Art History—Modern Art .....	4		
<sup>1</sup> ART 314	History of Photography or			
ART 315	Design History I .....			3-4
<sup>2</sup> Statistics elective (B.2.) .....			3	
ENGL 230/ENGL 231/ENGL 240	elective (C.1.) .....		4	
POLS 210	American and California Government (D.1.) .....	3		
ANT 201/GEOG 150/SOC 105	elective (D.4.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC	elective (D.4.) .....			3
CSC 110	Computers and Computing (F.1.) .....			3
ENGL 251/ENGL 252/ENGL 253	Great Books of World			
Literature (C.1.) .....			3	
HIST 315	Modern World History (D.2.) .....			3
Electives .....			0-2	0-2
Courses to complete major .....		7	4-6	3-4
		17	16	17
Senior				
ART 460	Professional Practices .....	2		
ART 461, ART 462	Senior Project .....		2	2
ART 463	Undergraduate Seminar .....			2
MU 101, MU 204 or TH 220	(C.2.) .....		3	
<sup>2</sup> Literature, philosophy, arts (except ART courses)	electives			
(300-400 level) (C.3.) .....			3	3
PHIL 230/PHIL 231	Philosophical Classics (C.1.) .....	3		
<sup>2</sup> Technology elective (F.2.) .....				3
PE 250	Health Education (E.2.) .....	2		
Electives .....		3	2	3
Courses to complete major .....		6	6	3
		16	16	16

<sup>1</sup> Students in the Graphic Design Option take ART 201, GRC 122, ART 315 and students in the Photography Option take ART 222, GRC 227, ART 314.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

# GRAPHIC DESIGN OPTION

(Add Courses Below to Basic Curriculum)

## Sophomore

- GRC 222 Advanced Design with Type (3)  
 GRC 223 Copy Preparation ..... (3)  
 ART 204 Watercolor ..... (3)

## Junior

- ART 331, ART 332, ART 333 Graphic Design ..... (9)  
 ART 316 Design History II ..... (3)

- ART elective (to be selected with adviser's approval) ..... (3)

## Senior

- ART 431, ART 432, ART 433 Advanced Graphic Design ..... (9)  
 ART 302/ART 303 Life Drawing .... (3)  
 ART 309 Illustration ..... (3)

# PHOTOGRAPHY OPTION

(Add Courses Below to Basic Curriculum)

## Sophomore

- ART 322 Color Photography I, Negative ..... (3)  
 ART 323 Color Photography II, Positive ..... (3)  
 ART 325 4x5 Camera Techniques, B/W ..... (3)

## Junior

- ART 326 4x5 Camera/Commercial .... (3)  
 ART 327 Portraiture B/W ..... (3)

- ART 422 Creative Photography, B/W (4)  
 ART 424 Multimedia Color Photography ..... (4)

## Senior

- ART 426 Illustration Photography I, B/W ..... (3)  
 ART 427 Illustration Photography II, Color ..... (3)  
 Approved electives in photography ..... (9)



# ENGLISH DEPARTMENT

Department Head (Interim), Brent Keetch

Patricia A. Brenner	Starr Jenkins	James J. Peterson
Carl R. V. Brown	David J. Kann	David R. Rollings
Edward A. Cairns	John F. Kerr	Mona G. Rosenman
Susan Currier	Alfred Landwehr	Habib Sheik
Gordon Curzon	Kathleen M. Lant	James E. Simmons
Max E. Darnielle	Donald P. Lazere	Douglas B. Smith
Arthur H. Frieztzsche	Robert G. Lint	Charles W. Strong
Katharine S. Gittes	Nancy Lucas	Gerald J. Sullivan
John F. Harrington	Robert McDonnell	William B. Wahl
Robert J. Huot	Michael P. Orth	Michael J. Wenzl
Gloria Jameson		

The English Department serves students through courses in writing, in literature, and in linguistics. The aim of the department is to provide students with greater expressive power, and with understanding and appreciation of literature. The department also endeavors to develop in students abilities valuable in the professional and business world and in private life: the abilities of reading critically, of organizing a large body of information, and of expressing the results in clear, forceful prose.

The department offers general education courses, courses for elective credit, a minor, and the Bachelor of Arts and the Master of Arts programs. An English major or minor is valuable as preparation for law, for business, and for other careers in which handling and expressing ideas are essential. Students interested in an English minor should write or visit the department office for details.

## CURRICULUM IN ENGLISH

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 215 Writing: Argumentation (A.4.) .....			4
ENGL 230, ENGL 231 Masterworks of British Literature (C.1.) ..		4	4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Mathematics elective (B.2.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Physical and life sciences electives (one with lab) (B.1.) .....	3	3	3
Electives .....	3	3	
	15	16	14
Sophomore			
ENGL 251, ENGL 252, ENGL 253 Great Books of World			
Literature (C.1.) .....	3	3	3
ENGL 290/ENGL 390/ENGL 395 .....		4	
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Mathematics or statistics elective (B.2.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ECON 201/ECON 211/ECON 222 elective (D.3.) .....			3
<sup>1</sup> Science, mathematics or statistics elective (B.2.) .....		3	
PHIL 311 History of Greek Philosophy (C.3.) .....	3		
Electives .....	4	3	
	16	16	15

	F	W	S
<b>Junior</b>			
ENGL 340, ENGL 341 American Literature .....	4	4	
ENGL 339 Introduction to Shakespeare .....			3
ENGL 330/ENGL 331/ENGL 332 British Literature .....	4	4	
ENGL 333/ENGL 334 British Literature .....			4
ENGL 302 Writing: Advanced Composition or ENGL 326 Literary Criticism .....	4		
ENGL 325 Creative Writing .....		4	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
CSC 110 Computers and Computing (F.1.) .....	3		
Electives .....		3	6
	15	15	16
<b>Senior</b>			
ENGL 350/ENGL 351/ENGL 352 Modern Novel, Poetry, or Drama .....	3		
English elective (300-400 level) .....	4		
English electives (400 level) .....	4	8	8
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Technology elective (300-400 level) (F.2.) .....			3
ENGL 461 Senior Project .....	2		
Electives .....	3	6	4
	16	17	15

### CURRICULUM FOR THE MASTER OF ARTS DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

Required:	Units
ENGL 502 Seminar in Critical Analysis .....	4
ENGL 503 Seminar in English Linguistics .....	4
ENGL 504 Seminar in Applied English Linguistics .....	4
ENGL 505 Seminar in Composition Theory .....	4
ENGL 511 Seminar in American Literature .....	8
ENGL 512 Seminar in British Literature .....	8
Additional units in the ENGL 400 and 500 series, selected with English Graduate Committee approval. ....	12
Elective units which may be at the 400 or 500 level in other departments, provided the English Graduate Committee approves .....	4
Total Units .....	48

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in English and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

# FOREIGN LANGUAGES DEPARTMENT

Department Head, William T. Little

Odile Clause

Bianca Rosenthal

Verlan H. Stahl

Instruction in French, German, and Spanish strongly emphasizes active language skills to prepare the student for specific technical, vocational, literary, and cultural needs at home and abroad.

Opportunity for study of languages other than French, German, and Spanish is provided through FORL 101, 102, 103. The subject matter and teaching methods used provide a usable, practical knowledge of the language studied.

Achievement is recognized by completion of a two-year Certificate of Proficiency program which consists of 30 quarter units plus a comprehensive examination.

Minors in French, German, and Spanish are offered by the Department. Each minor consists of 30 quarter units of course work specified by the department. Fifteen units must be completed in residence and a minimum grade point average of B must be maintained. The minor is conferred concurrently with the baccalaureate degree. Information and application forms for the declaration of a French, German, or Spanish minor are available in the Foreign Languages Department.

## CURRICULUM FOR FRENCH MINOR

	<i>Units</i>
FR 201, FR 202, FR 203 Intermediate French (3, 3, 3) .....	9
FR 221, FR 222, FR 223 French Conversation (2, 2, 2) .....	6
Electives to complete minor: .....	15
FR 301 Advanced French Composition and Grammar (3)	
FR 305 Significant Writers in French Literature (3) (repeatable to 12)	
FR 401 Techniques of Translation (4)	
FR 470 Selected Advanced Topics (1-3) (repeatable to 6)	
	<hr/> 30

## CURRICULUM FOR GERMAN MINOR

GER 201, GER 202, GER 203 Intermediate German (3, 3, 3) .....	9
GER 221, GER 222, GER 223 German Conversation (2, 2, 2) .....	6
Electives to complete minor: .....	15
GER 301, GER 302 Reading and Translation Skills (4, 4)	
GER 305 Significant Writers in German (4) (repeatable to 12)	
GER 470 Selected Advanced Topics (1-3) (repeatable to 6)	
	<hr/> 30

## CURRICULUM FOR SPANISH MINOR

SPAN 201, SPAN 202, SPAN 203 Intermediate Spanish (3, 3, 3) .....	9
SPAN 221, SPAN 222, SPAN 223 Spanish Conversation (2, 2, 2) .....	6
Electives to complete minor: .....	15
SPAN 301 Review of Spanish Grammar and Composition (3)	
SPAN 302 Advanced Conversation (3)	
SPAN 305 Significant Writers in Spanish (4) (repeatable to 12 units)	
SPAN 401 Techniques of Translation (4)	
SPAN 470 Selected Advanced Topics (1-3) (repeatable to 6)	
	<hr/> 30

# GRAPHIC COMMUNICATIONS DEPARTMENT

Department Head, Harvey R. Levenson

Herschel L. Apfelberg  
Eugene F. Coleman  
Peter R. Del Vaglio  
James R. Hutchinson

W. Stephen Mott  
Patrick A. Munroe  
Philip K. Ruggles

Guy H. Thomas, Jr.  
Joseph W. Truex  
John B. Wordeman

The Graphic Communications Department offers a four-year curriculum leading to the Bachelor of Science degree. The curriculum is designed to prepare graduates for positions of responsibility in the printing, publishing, and packaging industries.

The program provides courses in general education together with a core of printing technology courses. Courses which are specific to one of the curricular options are also provided. The student is introduced to all stages of the printing processes, and chooses a specialized option in the graphic communications field at the appropriate time. The program is not designed to provide vocational training for machine operators. Rather, students are educated for leadership as managers and other skilled professionals who are well grounded in printing technology.

The Graphic Communications Department occupies 33,000 square feet of floor space in the Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching aids. Ten well-equipped laboratories of printing equipment provide the student with diverse experience in the practical aspects of the industry.

## CURRICULAR OPTIONS

### Computer Graphic Communications

This option is designed for the Graphic Communications major who wishes a career in which computer applications are given prominence. The option prepares the student for careers in computer typography, estimating, scheduling, production management, quality control, and graphic terminal displays.

### Design Reproduction Technology

The Design Reproduction option prepares talented students for employment in a wide variety of design-related positions in graphic communications, such as art production, publication design, typography, and the mechanical preparation of art and copy. The program combines a broad technological background in the graphic arts with the principles of design.

### Packaging

This option is designed for the student who desires a career in the growing field of packaging. The program provides a basis for the analysis of problems in package design, technology, and management in both consumer and industrial packaging.

### Printing Management

This option is designed as a flexible program for the student interested in pursuing employment as a printing plant manager, planner, quality control specialist, production control specialist, estimator, or sales representative. The program also prepares the student for employment as a technical representative for manufacturers of graphic arts machinery and supplies.

## CURRICULUM IN GRAPHIC COMMUNICATIONS

Freshman		F	W	S
GRC 101	Introduction to Graphic Communications .....	2		
GRC 111	Substrates and Ink .....			4
GRC 122	Design with Type .....		5	
GRC 123	Binding and Finishing .....			3
GRC 132	Letterpress and Relief Specialties .....		3	
ENGL 114	Writing: Exposition (A.1.) .....	4		
ENGL 215	Writing: Argumentation or			
ENGL 218	Writing: Argumentation and Reports (A.4.) .....			4
¹ Mathematics elective (MATH 114/MATH 118/MATH 120)				
	(B.2.) .....		3-5	

## 160 Graphic Communications

	F	W	S
PHYS 121, PHYS 122, PHYS 123 General Physics or CHEM 121, CHEM 122 General Chemistry and CHEM 326 Survey of Organic Chemistry (B.1) .....	4	4	4
CSC 110 Computers and Computing (F.1.) .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education (E.2.) .....		2	
	16-18	17	18
<b>Sophomore</b>			
GRC 204 Introduction to Printing Management .....	3		
GRC 223 Copy Preparation for Reproduction .....		3	
GRC 224 Composition Systems I .....	2		
GRC 227 Process Camera .....	5		
GRC 228 Image Assembly and Platemaking .....		4	
GRC 229 Sheet-fed Offset Lithographic Presswork .....			5
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
<sup>1</sup> Life sciences elective (B.1.b.) .....			3-4
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
ENGL 251/ENGL 252/ENGL 253 Great Books of World Literature (C.1) .....	3	3	
ECON 211 Principles of Economics (D.3.) .....		3	
Courses to complete major (depending on option) .....	0-3	0-3	0-3
Electives .....		0-3	0-1
	16-19	13-19	11-16
<b>Junior</b>			
GRC 301 Composition Systems II .....	4		
GRC 303 Estimating .....			4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
GRC 333 Plant Organization and Layout .....			3
GRC 357 Screen Processes .....	2		
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
HIST 204 Growth of American Democracy (D.1.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
Courses to complete major (depending on option) .....	4-8	5-8	3-6
Electives .....	3	2	2
	16-20	16-19	15-18
<b>Senior</b>			
GRC 401 Printing Sales .....			3
GRC 416 Web Printing Technology .....	5		
GRC 417 Advanced Web Printing Technology .....			2
GRC 421, GRC 422 Printing Management .....	4	3	
GRC 461 Senior Project .....			2
HIST 315 Modern World History (D.2.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
ENGR 301 Technology in the 20th Century (F.2.) .....			3
PHIL 331 Ethics (C.3.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
Courses to complete major (depending on option) .....	3	6	4-8
	18	15	14-18

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)



**COMPUTER GRAPHIC COMMUNICATIONS OPTION**

(Add courses below to basic curriculum)

**Sophomore**

- CSC 207 Advanced Basic Programming ..... (3)  
 EL 219 Logic and Switching Circuits ..... (3)

**Junior**

- GRC 302 Technical Basics for Printing ..... (3)  
 CSC 221 Computer Principles and Programming ..... (3)  
 CSC 255 Computer Graphics Applications ..... (4)

- CSC 306 Minicomputer Systems ..... (4)  
 CSC 309 Microcomputer Architecture and Software Development ..... (4)  
 IE 214 Production Control ..... (2)

**Senior**

- GRC 429 Advanced Composition Systems ..... (3)  
 CSC 409 Microcomputer Systems ..... (4)  
 MGT 418 Quantitative Methods and Controls in Business ..... (3)

**DESIGN REPRODUCTION TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

- ART 131, 132, 133 Design Fundamentals ..... (9)

**Junior**

- GRC 323 Pre-Separated Art for Camera ..... (3)  
 GRC 335 Line and Halftone Media .. (4)  
 ART 331, ART 332, ART 333 Graphic Design ..... (9)

**Senior**

- GRC 336 Modern Copy Technology (4)  
 GRC 439 Advanced Line and Halftone Media ..... (4)  
 GRC 440 Advanced Copy Technology (4)

**PACKAGING OPTION**

(Add courses below to basic curriculum)

**Sophomore**

- ACTG 211 Financial Accounting ..... (4)

**Junior**

- GRC 302 Technical Basics for Printing ..... (3)  
 GRC 330 Packaging Materials and Substrates ..... (3)  
 FDSC 230 Elements of Food Processing ..... (4)  
 IT 327 Plastics Technology ..... (3)

**Senior**

- MKTG 204 Elements of Marketing .. (4)  
 GRC 326 Printing Equipment Management ..... (3)  
 GRC 431 Package Estimating ..... (3)  
 GRC 437 Consumer Packaging ..... (3)  
 FDSC 425 Food Evaluation ..... (3)  
 MKTG 303 Buyer Behavior ..... (4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graphic Communications and other subjects.

## PRINTING MANAGEMENT OPTION

(Add courses below to basic curriculum)

## Junior

GRC 302	Technical Basics for Printing .....	(3)
ACTG 211	Financial Accounting .....	(4)
ECON 212	Principles of Economics .....	(3)
CSC 207	Advanced Basic .....	(3)
MKTG 204	Elements of Marketing ..	(4)
MGT 206	Principles of Purchasing ..	(3)

## Senior

GRC 326	Printing Equipment Management .....	(3)
GRC 408	Newspaper and Publications Management .....	(3)
GRC 411	Estimating, Pricing and Costing .....	(4)
GRC 423	Printing Management .....	(4)
BUS 201	Business Law .....	(3)



## HISTORY DEPARTMENT

Department Head, Robert E. Burton

Timothy M. Barnes  
Lloyd N. Beecher  
George B. Cotkin  
Donald A. Grinde, Jr.  
Barbara M. Hallman

Donald W. Hensel  
Daniel E. Krieger  
Edward L. Mayo  
Barton C. Olsen

Max E. Riedlsperger  
Robert L. Rosenberg  
John G. Snetsinger  
Quintard Taylor, Jr.

The History Department offers a Bachelor of Arts degree built on a broad social science and humanities base. In addition, the History Department offers a broad range of courses on Latin America, East Asia, Africa, and the Middle East. Ethnic study courses are offered in Afro-American, Chicano, and Indian history. Through an agreement with the Political Science Department, history majors may take a 29-unit program of courses to complete a pre-law concentration.

The History major provides strong preparation for elementary and secondary teaching and for employment in government, politics and business, for law school and for graduate study.

### CURRICULUM IN HISTORY

Freshman	F	W	S
HIST 101, HIST 102, HIST 103 History of Western Civilization ....	3	3	3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 215 Writing: Argumentation (A.4.) .....			4
<sup>1</sup> Physical or life sciences electives (B.1.) .....		3	3
POLS 204 Basic Political Thought .....	3		
POLS 210 American and California Government (D.1.) .....		3	
HIST 221 Historical Craft .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2-4	
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
CSC 110 Computers and Computing (F.1.) .....	3		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
	16	14-16	16
Sophomore			
HIST 201, HIST 202, HIST 203 United States History (D.1.) .....	3	3	3
<sup>1</sup> Physical or life sciences elective (B.1.) .....	3		
<sup>1</sup> Mathematics or statistics elective (B.2.) .....			3
ECON 201 Survey of Economics			
ECON 211 Principles of Economics (D.3.) .....	3		
SOC 105 Introduction to Sociology .....	3		
GEOG 150 Human Geography .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 105 Introduction to International Relations .....			3
ANT 201 Cultural Anthropology (D.4.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
HIST 205 The U.S. in World Affairs .....		3	
<sup>2</sup> Electives .....	0-2	3	3
	15-17	15	15

	F	W	S
<b>Junior</b>			
HIST 301 Historiography .....	3		
HIST 315 Modern World History (D.2.) .....			3
U.S. History electives (300-400 level) .....	3	6	3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3	3	
<sup>1</sup> Physical or life sciences elective (B.1.) or Mathematics or statistics elective (B.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
<sup>1</sup> Technology elective (F.2.) .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....			3
<sup>2</sup> Elective .....			3
	15	15	15
<b>Senior</b>			
HIST 460 Senior Project .....	2		
European History electives (300-400 level) .....		3	3
History electives (300-400 level) .....	6	3	6
POLS 370 Contemporary Global Political Issues .....		3	
ANT/ECON/GEOG/POLS/SOCS/(300-400) electives .....		3	3
<sup>2</sup> Electives .....	7	6	3
	15	18	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in History and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> At least 10 units must be at the 300-400 level. Two years of foreign language are highly recommended. See adviser or department office for approved list.



## JOURNALISM DEPARTMENT

Department Head, Randall L. Murray

Nishan R. Havandjian

James H. Hayes

Ed J. Zuchelli

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All journalism majors must complete the basic journalism curriculum, which includes courses in the journalism core and supplementary courses in the humanities, natural sciences, and social sciences. Each major must also complete a specified number of required and elective courses in one of the following concentrations: Agricultural Journalism, Broadcast Journalism, News-Editorial, or Public Relations.

No more than 56 credits of the 198 applied toward the degree may be in journalism and related professional courses. Basic B/W Photography (ART 221) and certain other offerings in art and graphic communications may be included. Students must consult advisers. Transfer students may apply a maximum of 12 journalism and professionally related quarter units (includes photography and graphics courses) to the major. All such units must be lower division offerings. Students transferring into the program are advised to limit these units to equivalents for JOUR 118, JOUR 201, JOUR 203, or ART 221.

All journalism majors are expected to serve as staff members of departmental communications media, including *Mustang Daily*, the student newspaper; KCPR, the FM-stereo radio station or *Poly PR*, the public relations agency. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors student chapters of the Society of Professional Journalists, Sigma Delta Chi; the National Press Photographers Association; and the Agricultural Communicators of Tomorrow.

### CURRICULAR CONCENTRATIONS

#### Agricultural Journalism

Prepares for farm or farm-city careers in reporting and editing, radio and television news; public relations and publicity; advertising copywriting, and layout. Twenty-nine of the elective units must be chosen with the approval of the adviser.

#### Broadcast Journalism

Prepares students for careers as reporters and newscasters for radio and television. Emphasizes the acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in the news and public affairs aspects of the electronic media.

#### News-Editorial

Prepares students for reporting and editing jobs on the staffs of newspapers and wire services. Emphasizes acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in print media.

#### Public Relations

Prepares students for business, governmental, and institutional positions in public relations. Emphasizes the acquisition of knowledge and skills needed for future growth into management positions with the communications media and other institutions.

## CURRICULUM IN JOURNALISM

Freshman <sup>1</sup>	F	W	S
JOUR 118 Mass Media in Society .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MGT 118 Introduction to Human Relations in Business .....			3
<sup>2</sup> Mathematics or statistics elective (B.2.) .....		3	
BUS 101 The Business Enterprise .....			4
<sup>2</sup> Physical or life sciences electives (one each, one with lab) (B.1.) .....	3	3	3
JOUR 203 Reporting I .....			3
<sup>2</sup> Critical reading elective (C.1.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
CSC 110 Computers and Computing (F.1.) .....	3		
<sup>3</sup> Electives and courses to complete major .....	4	4	
	17	16	16
Sophomore			
JOUR 201 Journalism History .....	3		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
ART 221 Basic B/W Photography .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....			3
JOUR 333 Broadcast News I .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
JOUR 304 Reporting II .....		3	
<sup>2</sup> Mathematics or statistics elective (B.2.) .....	3		
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2-4		
ECON 201/ECON 211/ECON 222 (D.3.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
POLS 210 American and California Government (D.1.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>3</sup> Electives and courses to complete major .....	4-6	1	3
	17	17	18

F W S

## Junior

JOUR 312 Introduction to Public Relations .....	3		
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		6	
POLS 331 Political Parties and Interest Groups or POLS 332 Public Opinion and Political Participation .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
HIST 315 Modern World History (D.2.) .....	3		
<sup>2</sup> Physical or life sciences elective (B.1.) .....		3	
GEOG 315 Geography of Resource Utilization .....	3		
ENGR 301 Technology in the 20th Century .....		3	
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....			3
SOC 313 Urban Sociology .....			3
JOUR 302 Law for Journalists .....			3
AG 301 Agriculture and America (F.2.) .....		3	
<sup>3</sup> Electives and courses to complete major .....	5	3	6
	17	18	18

## Senior

POLS 403 Municipal Government or POLS 401 State and Local Government .....	3		
JOUR 460 Senior Project .....	3		
JOUR 444 Media Internship .....	4		
JOUR 405 Reporting III .....		3	
<sup>3</sup> Electives and courses to complete major .....	3	13	15
	13	16	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Journalism and other subjects.

<sup>1</sup> Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> 21 to 29 of the elective units must be taken in a field of concentration. Three concentrations also require the election of one course from among the following: JOUR 205, JOUR 401, JOUR 407, JOUR 425.



## MUSIC DEPARTMENT

Department Head, Bessie R. Swanson

Thomas H. Davies  
William V. Johnson  
Ronald V. Ratcliffe

Craig H. Russell  
John G. Russell

Clifton E. Swanson  
Graydon J. Williams

Through its courses and activities, the Music Department provides opportunities for personal enrichment to students from all other departments of the University. It offers students with an interest in music a broader insight into the general field of music through courses in appreciation, theory, harmony, and music history; it gives musically inclined students the opportunity to participate in University musical organizations and to further their proficiency both in singing and in playing instruments; and it provides the prospective teacher with basic skills and instructional techniques in music required for the elementary credential.

The Music Department also serves as a cultural center for both the University and community through a program of public performances by student and faculty groups and through department-sponsored concerts, clinics, workshops, and lectures by outstanding individuals from outside the University.

### CURRICULUM FOR MUSIC MINOR

A 28-unit minor is available to students who desire documented competency in music. An individualized curriculum based on the following guidelines will be developed in consultation with a member of the music faculty. Information and application forms for the declaration of a Music minor are available in the Music Department.

	<i>Units</i>
Lower Division Core .....	13
MU 101 Materials of Music-Theory I (3)	
MU 203 Theory II (3)	
MU 102 Sight-Singing and Ear-Training (1) or	
MU 103 Rhythm Skills (1)	
MU 204 Appreciation of Music (3)	
One year of vocal or instrumental study (3)	
Upper Division Electives .....	15
Chosen from 300-400 level Music courses (or, in some cases, specific courses offered by other departments).	
	28

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Music and other subjects.



# PHILOSOPHY DEPARTMENT

Department Head, Kendrick W. Walker

Stephen W. Ball  
A. C. W. Bethel  
Stanislaus J. Dundon  
Charles T. Hagen

Laurence D. Houlgate  
Russell A. Lascola  
Diane P. Michelfelder

Frederick J. O'Toole  
Judy D. Saltzman  
Talmage E. Scriven

The courses offered by the Philosophy Department are intended to provide an opportunity for students to examine fundamental questions about the human condition, and the importance of those questions to historical, scientific, religious, and social issues. These courses will acquaint the student with the problems of logic (the nature of argument), metaphysics (the nature of reality), epistemology (the nature and limits of human knowledge), and axiology (the nature of what is right or worthwhile), and with the historical development of these problems and the proposed solutions to them. The Philosophy Department also offers courses examining the patterns of belief and worship in the world's major religions. All these courses provide the student with an opportunity to participate in philosophical discussion and to develop proficiency in critically examining philosophical positions, with a view to enabling the student to develop a personal philosophy and a more comprehensive view of the world.

## CURRICULUM FOR PHILOSOPHY MINOR

Students may earn a minor in Philosophy by a coordinated course of study consisting of 25 units (13 specified, 12 chosen from an approved list) designed by the individual student and the Philosophy Department. Interested students are invited to contact the Philosophy Department.

### Units

Lower Division Courses .....	7
PHIL 220 Logic (4)	
PHIL 230/PHIL 231 Philosophical Classics (3)	
Upper Division Courses .....	18
PHIL 311 History of Greek Philosophy (3)	
PHIL 313 History of Modern Philosophy (3)	
Four courses selected from the following list, to be chosen in consultation with the student's minor adviser:	
PHIL 312 History of Medieval Philosophy (3)	
PHIL 307 Philosophy of Religion (3)	
PHIL 314 19th and 20th Century Philosophy (3)	
PHIL 315 Contemporary Philosophy (3)	
PHIL 321 Philosophy of Science (3)	
PHIL 322 Symbolic Logic (3)	
PHIL 331 Ethics (3)	
PHIL 333 Political Philosophy (3)	
PHIL 335 Social Ethics (3)	
PHIL 337 Professional Ethics (3)	
PHIL 341 Philosophy of Art (3)	

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Philosophy and other subjects.

## POLITICAL SCIENCE DEPARTMENT

Department Head, Randal L. Cruikshanks

William M. Alexander	Earl D. Huff	Carroll R. McKibbin
John H. Culver	Richard B. Kranzdorf	Allen K. Settle
David L. George	Dianne N. Long	Joseph N. Weatherby
Reginald H. Gooden, Jr.	Carl E. Lutrin	

The Political Science Department offers undergraduate instruction leading to the degree of Bachelor of Arts in Political Science. With a concern for theoretical principles as well as practical application, the degree requirements include both a common body of material and the completion of a curricular concentration or an individualized course of study in Political Science as listed below. Such curricular alternatives focus the training within the degree program toward career opportunities in government and other public agencies and in the legal profession.

In addition to the major in Political Science, the Department now offers a minor in Public Administration. Beyond that, the Political Science Department provides students in all curricula within the University with an understanding of the operations of local, state, and national government and the processes by which the individual and community interact in the several levels of government.

Through the required and elective courses, the Department seeks to expand each student's comprehension of the political process, to develop those skills and attitudes which are essential for effective citizenship, and to prepare each Cal Poly graduate for intelligent and responsible political behavior.

### PUBLIC ADMINISTRATION MINOR

Students interested in public sector careers may now enroll in the minor program in Public Administration. The minor consists of 27 units of course work and involves a supervised internship experience in a governmental agency. Details are available from the Political Science Department.

### CURRICULAR CONCENTRATIONS

#### International Affairs

This concentration is designed to prepare students for careers in government and related agencies which deal in the many problems in international affairs and to prepare students to enter graduate studies in the field of international relations.

#### Pre-Law

This concentration is designed to prepare students for careers in the several fields of law. Some students who complete this concentration may seek admission to accredited law schools to continue their preparation for the law profession. Others may seek careers in law-related professions such as law enforcement, probation, corrections and legal assistance.

#### Public Administration

This concentration is designed to prepare students for careers in administrative work in government and related agencies and to prepare students to enter graduate studies in the field of administration.

#### Teaching

This concentration is designed to prepare students for careers as elementary school teachers and for careers as social studies teachers in junior high schools and high schools.

#### Urban Studies

This concentration is designed to prepare students for careers in broad fields of planning within government and related agencies and to prepare students to enter advanced studies in the field of city and regional planning.

## INDIVIDUALIZED COURSE OF STUDY

This program is designed to provide career identity for students who do not select any of the above concentrations and to permit students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. It consists of 27 units of course work at the 300-400 level selected by the student and recommended by the student's academic adviser.

Concentrations in Community Studies, Criminal Justice, Cross-Cultural Studies, and Social Services are currently offered by the Social Sciences Department and may be taken by Political Science majors. In addition, the following concentrations from the School of Business may be taken: Accounting, Human Resources Management, International Business Management, Management, and Management Information Systems.

## CURRICULUM IN POLITICAL SCIENCE

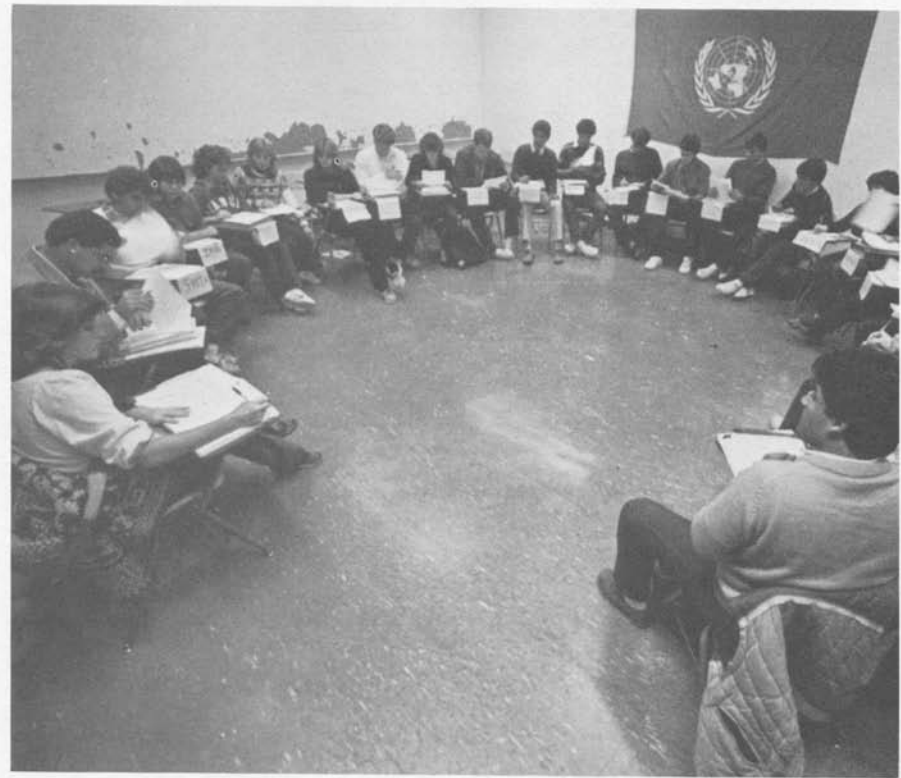
Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 215 Writing: Argumentation (A.4.) .....			4
POLS 100 Introduction to Political Science .....	3		
POLS 210 American and California Government (D.1.) .....	3		
POLS 102 California Government .....		3	
POLS 105 Introduction to International Relations .....			3
<sup>1</sup> ART/MU/TH elective (from approved department list) (C.2.) .....	3		
HIST 102, HIST 103 History of Western Civilization .....		3	3
HIST 205 U.S. in World Affairs .....			3
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education (E.2.) .....			2
<sup>2</sup> Electives and courses to complete concentration .....	2	2	0
	15	14	15
Sophomore			
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
<sup>1</sup> Technology elective (F.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
POLS 212 Comparative Politics .....	3		
<sup>1</sup> Mathematics elective (B.2.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
POLS 206 Judicial Process .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
<sup>1</sup> Computer literacy elective (F.1.) .....		3	
<sup>1</sup> Physical and life sciences electives (one each, one with lab) (B.1.) ....	3	6	3
<sup>2</sup> Electives and courses to complete concentration .....	2	2	2
	14	17	17

	F	W	S
<b>Junior</b>			
POLS 305 Political Analysis .....		5	
POLS 314 Public Administration .....	3		
POLS 204 Basic Concepts of Political Thought.....	3		
Political Science electives (300-400 level) .....		3	3
HIST 315 Modern World History (D.2.) .....	3		
GEOG 308 Global Geography .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/SOC elective (D.4.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.).....	3		
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....			6
<sup>2</sup> Electives and courses to complete concentration .....	2	0	3
	14	17	15
<b>Senior</b>			
POLS 461, POLS 462 Senior Project .....	2	2	
POLS 325 Public Policy Analysis .....	3		
Political Science electives (300-400 level) .....	6	9	6
<sup>2</sup> Electives and courses to complete concentration .....	6	6	8
	17	17	14

See COURSES OF INSTRUCTION section of this catalog for description of courses in Political Science and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> 7 units must be prefix other than POLS. 27 elective units at the 300-400 level must be chosen with the approval of the adviser in the field of concentration. Concentration lists available at the department office.



## SOCIAL SCIENCES DEPARTMENT

Department Head (Position Vacant)

James W. Coleman  
Barbara E. Cook  
Warren W. DeLey  
Donald R. Floyd  
Mahmud S. Hariri

Robert L. Hoover  
Ellen S. Horgan  
Harold R. Kerbo  
Patrick C. McKim  
John A. McKinstry

Leo W. Pinard II  
William L. Preston  
Richard A. Shaffer  
George J. Suchand  
Calvin H. Wilvert

The Social Sciences Department provides a broadly based orientation to the study of society. Students prepare for a wide range of careers in federal, state and local government; teaching; social services agencies; and criminal justice including probation, parole and law enforcement; as well as in business and industry. The flexible curriculum of the Department offers the student of the 1980's the opportunity for familiarization and analysis concerning the most sensitive and critical issues of the student's life.

The Social Sciences Department serves all of the schools of the campus in providing general education for citizenship. In general, the department seeks to provide the student with a better understanding of the society in which we live, to develop in the student those skills and attitudes which are prerequisites for effective citizenship, and to prepare and encourage the individual toward intelligent and responsible social action.

The occupational objectives of the department are to train students for those numerous entry jobs in civil service, business, industry, and social welfare which require a bachelor's degree with a major in the social sciences, and to train those who expect to teach social studies in elementary or secondary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of civil service positions.

The department offers the degree of Bachelor of Science in Social Sciences. This degree allows the student to choose among five concentrations leading to different careers.

### CURRICULAR CONCENTRATIONS

#### Community Studies

This concentration prepares students to apply social research methods to community problems. Currently evaluative research of many government programs and nonprofit organizations is being required to justify continued funding. In most cases, traditional economic cost benefit analysis techniques fail to conceptualize problems and separate the data for analysis. Students taking this concentration will learn both quantitative and qualitative techniques for assessment of program impacts.

#### Criminal Justice

This concentration is designed to prepare students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.

#### Cross-Cultural Studies

This concentration will prepare students for careers in a wide range of cross-cultural contexts: international development agencies, the public health field, intercultural education, plus numerous careers overseas in private industries.

#### Social Sciences (Teaching)

With proper selection of electives, this concentration leads to preparation for elementary or secondary teaching on completion of the fifth year. It also provides the student with a broad background for entry positions in business.

## 174 Social Sciences

### Social Services

By providing instruction in the social services area, this concentration prepares students to enter such fields as social work, corrections, probation, or parole.

Concentrations outside the Social Sciences Department also are offered as follows: Public Administration, Pre-Law, International Affairs or Urban Studies (Political Science Department); Human Resources Management, Management, or International Business Management (School of Business).

### CURRICULUM IN SOCIAL SCIENCES

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
SOC 105 Introduction to Sociology (D.4.) .....	3		
SOC 106 Social Problems .....		3	
HIST 204 Growth of American Democracy (D.1.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
GEOG 150 Human Geography .....	3		
ANT 201 Cultural Anthropology .....		3	
ANT 203 Physical Anthropology .....			3
<sup>1</sup> Physical or life sciences electives (one with lab) (B.1.) .....	3	3	6
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
GEOG 250 Physical Geography .....			3
LIB 101 Library Instruction .....	1		
<sup>2</sup> Electives and courses to complete major .....		3	2
	17	15	17
Sophomore			
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 105 International Relations .....	3		
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
SOC 323 Social Stratification .....		3	
ANT 202 World Prehistory .....			3
GEOG 215 Human Impact on the Earth .....	3		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Mathematics elective (B.2.) .....	3		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....	0-2	2	
	15-17	17	16

	F	W	S
<b>Junior</b>			
SOC 333, SOC 334 Social Research Methods I and II .....		3	3
HIST 315 Modern World History (D.2.) .....	3		
Political Science elective (300-400 level) .....	3		
History elective (300-400 level) .....		3	
Geography 300-400 level courses .....			3
Anthropology elective (300-400 level) .....		3	
Sociology elective (300-400 level) .....			3
<sup>1</sup> Technology elective (F.2.) .....			3
<sup>1</sup> Economics elective (D.3.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2-4		
<sup>2</sup> Electives and courses to complete major .....	<u>6</u>	<u>5</u>	<u>2</u>
	14-16	17	17
<b>Senior</b>			
SOCS 461, SOCS 462 Senior Project .....	2	2	
SOCS 463 Undergraduate Seminar .....			3
Anthropology electives (300-400 level) .....	3	3	
Sociology electives (300-400 level) .....		3	3
SOC 421 Social Theory .....		3	
History elective (300-400 level) .....	3		
Geography electives (300-400 level) .....	3		3
<sup>1</sup> BUS/ECON/POLS elective (D.4.) .....			3
<sup>2</sup> Electives and courses to complete major .....	<u>6</u>	<u>6</u>	<u>5</u>
	17	17	17

See COURSES OF INSTRUCTION sections of this catalog for descriptions of courses in Anthropology, Geography, Social Sciences, Sociology and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> 27 of the elective units must be chosen with the approval of the adviser in a field of concentration.



## SPEECH COMMUNICATION DEPARTMENT

Department Head, Harry Sharp, Jr.

James R. Conway  
James R. Emmel  
Michael L. Fahs  
David R. Henry

Roger L. Kenvin  
Michael R. Malkin  
Pamela Cook Miller  
Keith E. Nielsen

Russell G. Whaley  
Joyce H. Wright  
Raymond F. Zeuschner

The Speech Communication Department, through its courses in speech and theatre, serves the entire University. Its offerings enable students to fulfill requirements in general education, prepare for communication-centered careers, and/or enhance both cultural awareness and individual potentials.

The objectives of the Speech Communication Department are to teach the composite knowledge and skills of the communication arts and sciences, both for students preparing for communication-oriented careers and for prospective teachers in the public schools.

The Speech Communication Department offers a Bachelor of Arts degree, a minor and a teacher certification program. All majors must complete a basic core curriculum. Then they consult with their advisers to choose a program of appropriate support courses in speech, theatre, and related subjects. Minors must complete the program listed below. Specializations may be elected through advisement in the following areas: Child Language Development, Organizational Communication, Pre-Law, Public Relations, Technical Theatre, Theatre Management, or Theatre Performance. Please consult with department advisers for details. The total program of the Speech Communication Department is geared not only toward a broad theoretical knowledge of the discipline but also toward providing many opportunities for participation in a variety of communication-related activities.

Many cocurricular activities are available for students interested in the speech arts. Intercollegiate forensic tournaments provide opportunities for Cal Poly speakers to compete with students from other universities and colleges in debate and other speech events. The University theatre program annually presents a full season of plays. Additional student activities include public speaking, oral interpretation, and interpreters theatre presentations to campus and community audiences.

### CURRICULUM FOR SPEECH COMMUNICATION MINOR

A 24-unit minor is available for students who desire documented competency in Speech Communication. After completing the core courses listed below, students may select the remainder of their courses from an approved list. Copies of the list and further information and application forms are available in the Speech Communication Department office.

	<i>Units</i>
Required courses: .....	14
SPC 201 Public Speaking or	
SPC 202 Principles of Speech (3)	
SPC 212 Interpersonal Communication (3)	
SPC 325 Argumentation and Debate (4)	
SPC 312 Communication Theory (4)	
Electives: .....	10
10-16 units of Speech Communication of which at least 8 units must be 300-400 level.	24

### CURRICULAR CONCENTRATION

#### Communication Studies

This concentration provides Speech Communication majors with a program focused on the understanding and application of rhetorical principles. Consult the department advisers for course listings.



## CURRICULUM IN SPEECH COMMUNICATION

Freshman	F	W	S
SPC 101 Professional Fields of Speech .....	1		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking (A.3.) .....			3
SPC 212 Interpersonal Communication .....	3		
SPC 203 Voice and Articulation .....	3		
SPC 250 Forensic Activity .....		1	
ENGL 114 Writing: Exposition (A.1.) .....	4		
HIST 101, HIST 102 History of Western Civilization .....		3	3
HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
<sup>1</sup> Physical or life sciences elective (one with lab) (B.1.) .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
<sup>1</sup> Mathematics, physical or life sciences elective (B.1. or B.2.) .....	3		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
Electives .....		3	3
	16	16	15
Sophomore			
SPC 217 Essentials of Discussion .....		4	
SPC 305 Oral Interpretation .....			4
TH 220 Introduction to Theatre (C.2.) .....	3		
ENGL 215 Writing: Argumentation (A.4.) .....	4		
SPC 350 Advanced Forensic Activity .....		2	
PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> Life sciences elective (B.1.b.) .....		3	
<sup>1</sup> Physical sciences elective (B.1.a.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....	3		
Electives .....	3	3	2
	16	15	15



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	F	W	S
<b>Junior</b>			
SPC 312 Communication Theory .....		4	
SPC 320 Nonverbal Communication .....			3
SPC 322 Persuasion .....			4
SPC 330 Classical Rhetorical Theory .....	4		
SPC 412 Organizational Communication .....		3	
SPC 460 Undergraduate Seminar .....			1
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
<sup>2</sup> ENGL 302 Writing: Advanced Composition .....	4		
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Support courses .....	3		4
	17	16	15
<b>Senior</b>			
SPC 411 Communication Research .....	4		
SPC 430 Rhetorical Criticism .....		4	
SPC 461 Senior Project .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
<sup>1</sup> Economics elective (D.3.) .....	3		
Theatre or Speech Communication electives (300-400 level) .....	4	3	4
<sup>3</sup> Support courses .....		4	3
Electives .....	3		7
	17	14	14

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Speech Communication, Theatre and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 6 units must be at 300-400 level). (Please see page 47 of this catalog.)

<sup>2</sup> Or score of 5 on Junior Writing Test.

<sup>3</sup> 14 units from courses chosen with approval of student's adviser; minimum of 7 units at 300-400 level.





# School of Engineering and Technology

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[illegible]

## SCHOOL OF ENGINEERING AND TECHNOLOGY

William F. Horton, Dean (Interim)  
Gustav N. Wassel, Associate Dean (Interim)

The Accreditation Board for Engineering and Technology defines engineering as "the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

Engineering at Cal Poly is strongly oriented toward preparing young people for immediate entry into the practice of engineering upon graduation from one of the four-year bachelor's degree programs. Each student selects a major at entrance and generally takes at least one course in that major each quarter. This early introduction to engineering increases motivation to master the mathematics, basic science, and engineering science which constitute a very important portion of each engineering curriculum.

Engineering graduates of Cal Poly are in great demand and find a large variety of challenges awaiting them. They enter professional occupations such as engineering design, test and evaluation, systems analysis, manufacturing, applied research, development, sales, and field engineering. Cal Poly graduates pursue their careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

Engineering curricula offered in the School of Engineering and Technology leading to the Bachelor of Science degree are: Aeronautical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical Engineering. These nine engineering disciplines provide the education for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate school at Cal Poly or another institution. Cal Poly offers a Master of Engineering degree in several fields of study.

The School of Engineering and Technology also offers curricula leading to the Bachelor of Science degree in Engineering Technology and Industrial Technology and the Master of Arts in Industrial Arts.

The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

Industrial technology is defined by the National Association of Industrial Technology as a baccalaureate degree program designed to prepare individuals for technical managerial, production supervisory, and related types of professional leadership positions.

The Industrial Education Option in Industrial Technology provides professional and credentialing preparation of future industrial education teachers for the secondary schools and community colleges.

Attention is directed to the preceding chart on recommended community college preparation for engineering and technology major curricula. This chart should be studied and followed in order to prevent loss of time in completing the program after transferring to Cal Poly.

Engineering students must select their social sciences and humanities electives with a view to satisfying not only the general education-breadth requirement of The California State University, but also the humanities and social sciences requirements of the Accreditation Board for Engineering and Technology (ABET). *(No skills classes are acceptable.)*

## MASTER OF ENGINEERING

### General Characteristics

The Master of Engineering program has as its objectives :

- 1) Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- 2) Both updating and upgrading opportunities for practicing engineers;
- 3) Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- 4) A base which allows graduates to maintain currency in their fields.

### Prerequisites

Usually, for admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test and Subject (Advanced) Test of the Graduate Record Examination in engineering. An applicant who meets these standards but lacks prerequisite course work may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Dean of the School of Engineering and Technology.

### Program of Study

Graduate students must file a formal study plan with their adviser by no later than the end of the quarter in which the 12th unit of approved courses is completed.

This graduate study plan must include a minimum of 45 units (at least 24 of which must be at the 500 level) with a primary field of study in one of the following areas:

- Aeronautical Engineering
- Civil and Environmental Engineering
- Computer Engineering
- Electrical Engineering
- Electronic Engineering
- Industrial Engineering
- Mechanical Engineering
- Metallurgical Engineering

The broad curriculum requirements for the Master of Engineering degree are:

- a) a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level; \*
- b) a minimum of 9 units chosen from mathematics, statistics, computer science, or from an approved list of engineering courses, with at least 3 units at the 500 level;
- c) the remaining units taken from a list of approved electives;
- d) at least 24 units of the 45 unit program at the 500 level.

---

\* Nine units of design project or thesis may be replaced by nine units of course work and a comprehensive examination with approval of the student's graduate committee.



## AERONAUTICAL AND MECHANICAL ENGINEERING DEPARTMENT

Department Head, Raymond G. Gordon

Alfred E. Andreoli	Michael A. Iannce	Philip W. B. Niles
James G. Andresen	John J. Kane	William B. Patterson
Edward H. Baker	Rodney G. Keif	D. John Price
Thomas W. Carpenter	Don C. Lemmon	Doral R. Sandlin
William E. Clark	James G. LoCascio	Ramesh T. Shah
Franklin S. Crane	Fredrick B. Malmborg	Edward O. Stoffel
Otto C. Davidson	Ronald S. Mullisen	Jack D. Wilson
Edward R. Garner	Lawrence H. Nelson	Yuen Cjen Yong
Jon A. Hoffmann	Saeed Niku	

### CURRICULUM IN AERONAUTICAL ENGINEERING

The Bachelor of Science degree in Aeronautical Engineering prepares students for engineering work dealing with aerodynamics, flight testing, structures, propulsion, controls, and ground support equipment for aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

The curriculum in Aeronautical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It places emphasis on both analysis and design. Supplementary to both is the basic work in drafting, shops, and laboratory. Throughout the entire four-year curriculum there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

Graduates in Aeronautical Engineering obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, and field engineering.

There are laboratory facilities for fabrication, propulsion, structural test, and aerodynamics, and also two design rooms and a hangar with an adjoining airstrip.

There are two student chapters of the national societies—the American Institute of Aeronautics and Astronautics and the American Helicopter Society.

Freshman	F	W	S
AERO 121, AERO 122, AERO 123 Aerospace Fundamentals .....	1	1	1
<sup>1</sup> Manufacturing Processes elective .....		1	
ETME 141 Applied Descriptive Geometry .....	2		
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
CHEM 124 General Chemistry (B.1.a.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
	<hr/> 17	<hr/> 17	<hr/> 17

	F	W	S
<b>Sophomore</b>			
AERO 202 Problems in Aeronautical Engineering .....	2		
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
CE 204, CE 205, CE 206 Strength of Materials and Laboratory .....		3	3
EE 201, EE 261 Electric Circuit Theory and Laboratory .....			4
PHYS 133 General Physics .....	4		
PHYS 210 Modern Physics .....		4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 318 Advanced Engineering Mathematics (B.2.) .....			4
<sup>1</sup> Manufacturing Processes elective .....	1		
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
	17	18	17



	F	W	S
<b>Junior</b>			
AERO 301, AERO 302, AERO 303, AERO 304 Aerothermodynamics and Laboratory .....	5	5	5
AERO 324 Stress Analysis .....			4
AERO 305, AERO 306 Aerodynamics I and II .....		3	3
AERO 307 Wind Tunnel and Flight Test Laboratory .....			2
CSC 332 Introduction to Numerical Methods (F.1.) .....	3		
ME 316, ME 317 Mechanical Vibrations and Laboratory .....	4		
EL 321, EL 361 Electronics and Laboratory .....		4	
MET 306 Materials Engineering .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
IE 314 Engineering Economics .....			3
	18	18	17
<b>Senior</b>			
AERO 420, AERO 421 Stability and Control of Aircraft I and II ....	3	3	
AERO 444, AERO 445 Flight Vehicle Design .....		4	4
AERO 401 Propulsion Systems .....		4	
AERO 405 Aerodynamics III .....			3
AERO 408 Advanced Flight Vehicle Structural Analysis .....	4		
AERO 404 Gas Dynamics .....	4		
AERO 461, AERO 462 Senior Project .....	2	3	
AERO 464 Industry Seminar .....	1		
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
<sup>2</sup> Literature, philosophy, arts elective (3 units at 300-400 level) (C.3.) .....			6
<sup>3</sup> Aeronautical Engineering electives .....		3	
	17	17	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Aeronautical Engineering and other subjects.

### CURRICULUM IN MECHANICAL ENGINEERING

The Bachelor of Science degree in Mechanical Engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of rigid, fluid, and thermal mechanics in the design and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering testing, supervision of manufacture and erection.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in heating, ventilating, air conditioning and solar engineering (HVAC/solar) or petroleum engineering or in general professional specialties as approved by the adviser. Engineering courses are found in all four years. In the junior and senior years, the professional specialties include such courses as turbomachinery, mechanical design, heat and mass transfer, mechanical control systems, and solar systems. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Laboratories are an important part of the student's education. The student is enrolled in mechanical engineering laboratories from the beginning of the freshman year until graduation. These laboratories include work in power generation, fluid flow, heat transfer, vibration, strength of materials, and others.

<sup>1</sup> ETMP 121 required; the remaining unit may be selected from ETMP 144, ETWT 144, IE 141, IE 142 or IT 141.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser.

<sup>3</sup> To be chosen with adviser approval.

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There are four organized student clubs associated with Mechanical Engineering: a student branch of the American Society of Mechanical Engineers, the Alternative Energy Club, a student branch of the Society of Automotive Engineers, and a student branch of the American Society of Heating, Refrigerating and Air Conditioning Engineers. These clubs offer students an active program of professional and social activity.

### CURRICULAR CONCENTRATIONS

#### General

The term "general" is used to distinguish the variety of programs available under traditional mechanical engineering from the HVAC/solar concentration and petroleum concentration below.

#### Heating, Ventilating, Air Conditioning, and Solar

This concentration prepares students to enter those phases of engineering dealing with thermal and solar systems and their control. These applications include: heating, ventilating and air conditioning of buildings; energy conservation and management; active and passive solar heating; and cooling and industrial refrigeration.

#### Petroleum

This concentration places emphasis on the engineering necessary for the production and field development of petroleum reserves.

#### Freshman

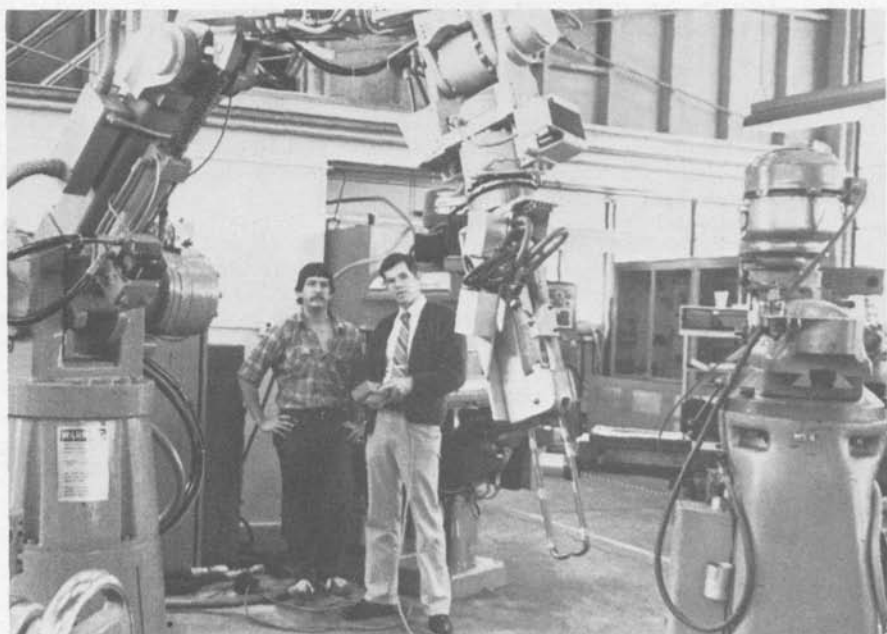
	F	W	S
ME 134, ME 136 Mechanical and Thermal Systems .....	3	3	
ETME 141 Applied Descriptive Geometry .....	2		
ETME 142, ETME 143 Engineering Drawing I, II .....		1	1
<sup>1</sup> Manufacturing Processes electives .....		2	3
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
ENGR 251 Digital Computer Applications (F.1.) .....			2
	17	18	17

#### Sophomore

ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....			4
CE 204, CE 205, CE 206 Strength of Materials and Laboratory .....		3	3
MET 306, MET 341 Materials Engineering and Laboratory .....		4	
PHYS 133 General Physics .....	4		
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....	3		
MATH 318 Advanced Engineering Mathematics (B.2.) .....			4
PSY 202 General Psychology (E.1.) .....		3	
ECON 201 Survey of Economics (D.3.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
	17	17	17

## Junior

ME 327 Introduction to Design .....			5
ME 302, ME 303, ME 343 Thermodynamics and Laboratory .....	3	3	1
ME 341, ME 342, ME 345 Fluid Mechanics and Laboratory .....		3	4
ME 316, ME 317 Mechanical Vibrations and Laboratory .....		4	
ME 313 Heat Transfer .....		3	
EE 201, EE 261 Electric Circuit Theory and Laboratory .....	4		
EL 321, EL 361 Electronics and Laboratory .....		4	
IE 314 Engineering Economics .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
HIST 315 Modern World History (D.2.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....	4		
<sup>2</sup> Required and elective courses to complete major .....			4
	18	17	17



## Senior

ME 422 Mechanical Control Systems .....	4		
ME 461, ME 462 Senior Project and			
ME 463 Undergraduate Seminar .....	2	3	2
<sup>3</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>3</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
<sup>2</sup> Required and elective courses to complete major .....	8	9	6
	17	18	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Mechanical Engineering and other subjects.

<sup>1</sup> Chosen from ETMP 144; IE 141; ETWT 144; and either IT 141 or IT 327 (but not both).

<sup>2</sup> 27 elective units must be chosen in a field of concentration. Concentration lists are available in the departmental office.

<sup>3</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 47 of this catalog.)

## CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

Department Head, Peter Y. Lee

Marshall L. Anderson  
Harold M. Cota  
Stephen Hockaday  
Cal C. Hsieh

Stuart E. Larsen  
H. Mallareddy  
Dragoslav Misis

L. Alexander Ortiz  
Robert E. Sennett  
Samuel A. Vigil

### CURRICULUM IN CIVIL ENGINEERING

Civil engineers are concerned with the structures in which we live and work, the transportation systems by which we travel, and the environment around us. The Bachelor of Science degree in Civil Engineering emphasizes the study of engineering principles and the application of scientific knowledge and technology for the betterment of mankind. The program stresses the team design concept and systems approach to problem solving and is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates of the program are trained for the expanding needs of society in transportation, structure and environment under the broad Civil Engineering degree. The emphasis is on preparation for immediate entry into the profession. Students completing the program will find a wide variety of positions available in local, state, and federal government service or with private engineering firms. These include positions involved in the planning, design, and construction of civil engineering projects.

The curriculum includes surveying, structural engineering, hydraulics, geotechnical engineering, sanitary engineering, and transportation planning—all based upon broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. The program is oriented toward the practical problems of the industrial world, but adequate scientific depth is maintained so that graduates will be readily accepted into graduate programs in civil engineering.

Freshman	F	W	S
CE 111, CE 112 Civil Engineering Fundamentals I and II .....	1	2	
ETME 141 Applied Descriptive Geometry .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131 General Physics (B.1.a.) .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
1 Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
	16	16	17

	F	W	S
<b>Sophomore</b>			
CE 221 Transportation Engineering I .....	4		
CE 204, CE 205, CE 206 Strength of Materials and Laboratory .....		3	3
CE 259 Civil Engineering Materials .....			2
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
ME 341 Fluid Mechanics .....			3
AE 237, AE 238 Engineering Surveying .....		2	2
MATH 241 Analytic Geometry and Calculus (B.2.) .....	4		
MATH 242 Differential Equations .....		4	
GEOL 201 Physical Geology .....			3
PHYS 132, PHYS 133 General Physics .....	4	4	
ECON 211 Principles of Economics (D.3.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
	18	17	16
<b>Junior</b>			
CE 352, CE 353 Structural Analysis I and II .....	3	3	
MET 306, MET 341 Materials of Engineering and Laboratory .....	3	1	
CE 355 Reinforced Concrete Design .....			3
CE 381 Geotechnical Engineering I .....		4	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....			4
IE 314 Engineering Economics .....	3		
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
CSC 331 Numerical Linear Analysis (F.1.) .....	3		
ME 302 Thermodynamics I .....		3	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....			4
CE 336 Water Resources Engineering .....		4	
CE 337 Hydraulics Laboratory .....			1
ENVE 331 Introduction to Environmental Engineering .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
	18	18	18
<b>Senior</b>			
STAT 321 Statistical Analysis (B.2.) .....			3
CE 453 Structural Steel Design .....	3		
CE 461, CE 462 Senior Project .....	2	3	
CE 440 Water and Wastewater Engineering .....			4
CE 481 Geotechnical Engineering II .....	4		
CE 464 Professional Practice .....		3	
CE 421 Transportation Engineering II .....		4	
CE 407 Structural Dynamics .....			4
CE 454 Structural Design .....			4
PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking (A.3.) .....		3	
<sup>1</sup> Literature elective (300-400 level) (C.3.) .....	3		
<sup>1</sup> Humanities elective (300-400 level) (C.3.) .....		3	
<sup>2</sup> Approved technical electives .....	3	3	3
	18	19	18

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 47 of this catalog.)

<sup>2</sup> To be selected with adviser approval from departmental list.

## CURRICULUM IN ENVIRONMENTAL ENGINEERING

The Bachelor of Science degree in Environmental Engineering is concerned with the interrelation of man, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, reduction of noise and vibration, and solid waste management.

The program offers a sound background in the fundamentals of thermodynamics, heat transfer, fluid mechanics, mass transfer, and physico-chemical characteristics of living and inanimate matter. The problem-oriented approach to instruction, in modern well-equipped laboratories, shops and design rooms, provides the student an excellent opportunity to gain understanding and experience in a joint exploration with the faculty. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Environmental Sciences and Engineering Club offers vigorous programs of technical and other activities, including field trips each year to the Los Angeles and San Francisco areas to study typical installations of systems. Student memberships also are available in the Air Pollution Control Association, the California Water Pollution Control Association, and the Water Pollution Control Federation.

An engineering approach to the subject enables graduates to pursue careers in industry, consulting firms, and public agencies concerned with air and water pollution control, potable water treatment, and solid waste management.

Freshman	F	W	S
ETME 141 Applied Descriptive Geometry .....			2
CE 111, CE 112 Civil Engineering Fundamentals I and II .....	1	2	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
CHEM 124, CHEM 125, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....	3		
	16	18	17
Sophomore			
CE 221 Transportation Engineering I .....	4		
CE 204, CE 205 Strength of Materials .....		3	2
ME 341 Fluid Systems .....			3
ME 211 Engineering Statics .....		3	
ME 212 Engineering Dynamics .....			4
ME 302 Thermodynamics .....			3
MATH 241 Analytic Geometry and Calculus (B.2.) .....	4		
MATH 242 Differential Equations .....		4	
PSY 202 General Psychology (E.1.) .....			3
PHYS 133 General Physics .....	4		
<sup>1</sup> Critical reading elective (C.1.) .....	3		
STAT 321 Statistical Analysis (B.2.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
ECON 211 Principles of Economics (D.3.) .....			3
CHEM 326 Survey of Organic Chemistry .....		4	
	18	17	18



# Civil and Environmental Engineering 193

	F	W	S
<b>Junior</b>			
ENVE 326 Air Pollution Measurements .....			3
ENVE 309 Noise and Vibration Control .....	3		
ME 313 Heat Transfer .....	3		
ENVE 325 Environmental Air Quality .....	3		
ENVE 304 Thermodynamics of Processes .....		3	
ENVE 316 Automatic Process Control .....			2
CE 381 Geotechnical Engineering I .....		4	
CE 336 Water Resources Engineering .....		4	
CE 337 Hydraulics Laboratory .....		1	
EE 201 Electric Circuit Theory .....	3		
EE 261 Electric Circuit Laboratory .....		1	
<sup>1</sup> Literature elective (300-400 level) (C.3.) .....		3	
CSC 331 Numerical Linear Analysis (F.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....			3
SPC 201 Public Speaking (A.3.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
	18	16	18
<b>Senior</b>			
ENVE 421 Mass Transfers Operations .....			3
ENVE 441, ENVE 442 Advanced System Design .....	3	3	
ENVE 422 Environmental Radiation Surveillance .....		2	
ENVE 461, ENVE 462 Senior Project .....	2	3	
ENVE 411 Air Pollution Control .....	3		
IE 314 Engineering Economics .....			3
HIST 315 Modern World History (D.2.) .....	3		
ENVE 428 Meteorology .....		3	
ENVE 434 Water Quality Measurements .....		2	
ENVE 435 Water and Wastewater Treatment .....	4		
<sup>1</sup> Humanities elective (300-400 level) (C.3.) .....	3		
ENVE 438 Water and Waste Water Treatment .....		3	
ENVE 439 Solid Waste Management .....			2
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
Approved technical electives .....		3	6
	18	19	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Civil Engineering, Environmental Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

## ELECTRONIC AND ELECTRICAL ENGINEERING DEPARTMENT

Department Head, James G. Harris

Richard A. Bucich  
Thomas T. L. Chou  
Michael M. Cirovic  
Edward J. Clerkin  
Clifford B. Cloonan  
S. K. Datta  
Art Dickerson  
Richard K. Dickey  
Eugene D. Fabricius

Michael J. Fitzpatrick  
Saul Goldberg  
Harry Hazebrook  
William F. Horton  
John W. McCombs  
Wayne E. McMorran  
Shien-Yi Meng  
Ahmad Nafisi

Jacques C. Sabto  
Terry R. Stanhope  
Shyama C. Tandon  
James H. W. Tseng  
Gustav N. Wassel  
Donley J. Winger  
Michael T. Wollman  
Chuan-Sung Yeh

The Electronic and Electrical Engineering Department offers two degree programs which are accredited by the Accreditation Board for Engineering and Technology: the Bachelor of Science degree in Electronic Engineering and the Bachelor of Science degree in Electrical Engineering. When applying for admission, one of the two majors must be selected. These two majors have identical curricula through the sophomore year with minor differences in the junior year. Consequently, the student may elect a major change from one to the other as late as the junior year.

The main objective of the department is to prepare the student for engineering; i.e., pursuing solutions to urgent problems in reshaping the environment to meet human needs while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current, practical engineering knowledge. The student begins the major in the first quarter with orientation and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically into design which begins in the third year.

Senior students select specialized technical courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work may select appropriate senior courses in keeping with this goal. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems. Learning in the humanities and the social sciences extends over all years.

The Electronic and Electrical Engineering Department offers three areas of specialization in graduate studies. These areas are computer systems, electronics/communications, and power/control systems. A Master of Engineering degree is awarded to students completing the 45-unit graduate program. More detailed information is provided in the *Graduate Studies Bulletin*.

Students are encouraged to participate in appropriate professional clubs such as: the Student Branch of the Institute of Electrical and Electronic Engineers, an international professional society; Eta Kappa Nu, a National Electrical and Electronic Engineering scholastic honor society; Poly Phase Club, a socially oriented organization; International Society for Hybrid Micro-electronics; and the Audio Engineering Society.

## BASIC CURRICULUM

The first two years of the Electronic Engineering and Electrical Engineering curricula introduce the student to material basic to both of these disciplines.

Freshman	F	W	S
EE 110 Orientation .....	1		
EE 112 Basic Circuit Analysis .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
CSC 101 Fortran Programming .....	2		
ETEL 151 Electronic Graphics and Standards .....	2		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
	17	18	17
Sophomore			
EE 211, EE 212 Basic Electric Circuit Analysis .....	3	3	
EE 241, EE 242 Basic Circuits Laboratory .....	1	1	
EL 207 Introduction to Electric and Magnetic Fields .....		3	
EL 208, EL 248 Electronic Devices and Laboratory .....			4
EL 219 Logic Switching Circuits .....	3		
CSC 311 Numerical Engineering Analysis (F.1.) .....			3
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 317 Topics in Engineering Mathematics (B.2.) .....			4
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
MET 306 Materials Engineering .....	3		
HIST 204 Growth of American Democracy (D.1.) .....			3
ECON 201/ECON 211/ECON 222 elective (D.3.) .....		3	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....			4
	17	18	18

## CURRICULUM IN ELECTRICAL ENGINEERING

Electrical engineering is that branch of engineering which deals with industrial process control systems and with generation, distribution, control and utilization of electric power. The curriculum includes basic circuit, field and device theory accompanied by control systems and power system analysis. The curriculum is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability and solid state motor control.

The Electric Power Institute, sponsored by the University and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the power field and provides limited student and faculty exchange opportunities.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

Junior	F	W	S
EE 301 Network and System Analysis .....	3		
EE 341 Advanced Circuit Laboratory .....	1		
EE 302, EE 342 Linear Control Systems and Laboratory .....		4	
EE 303 Power Transmission .....			3
EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory .....	4		
EL 307, EL 347 Digital Integrated Electronics and Laboratory .....	4		
EL 308, EL 348 Electronic Circuits and Laboratory .....		4	
EL 309, EL 349 Integrated Electronic Circuits and Laboratory .....			4
EL 319 Digital System Design .....		3	
EL 334 Electromagnetic Fields I .....			3
PHYS 210 Introduction to Modern Physics .....	4		
ME 302 Thermodynamics I .....		3	
ME 313 Heat Transfer .....			3
POLS 210 American and California Government (D.1.) .....			3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	2	4	
	18	18	16
Senior			
EE 406 Power System Analysis I .....	4		
EE 461, EE 462 Senior Project .....	2	2	
EE 463 Undergraduate Seminar .....			2
ME 341 Fluid Mechanics .....	3		
<sup>2</sup> Approved technical electives .....	4	6	5
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
IE 314 Engineering Economics .....	3		
HIST 315 Modern World History (D.2.) .....			3
	16	17	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> A minimum of two senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required.

## CURRICULUM IN ELECTRONIC ENGINEERING

Electronic engineering is that branch of engineering which deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. The curriculum includes circuit, field and device theory accompanied by logic and switching circuit design. The curriculum is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, and solid state devices.

There are appropriate laboratories equipped to support the program. They provide not only hands-on in instrumentation experience, but also design experience.

Junior	F	W	S
EL 303, EL 343 Signal Transmission and Laboratory .....			4
EL 307, EL 347 Digital Integrated Electronics and Laboratory .....	4		
EL 308, EL 348 Electronic Circuits and Laboratory .....		4	
EL 309, EL 349 Integrated Electronic Circuits and Laboratory .....			4
EL 319 Digital System Design .....		3	
EL 334 Electromagnetic Fields I .....			3
EE 301 Network and System Analysis .....	3		
EE 341 Advanced Circuits Laboratory .....	1		
EE 302 Linear Control Systems .....		3	
EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory .....	4		
PHYS 211 Modern Physics .....	4		
ME 302 Thermodynamics .....		3	
ME 313 Heat Transfer .....			3
EL 328 Discrete Time Systems .....		3	
POLS 210 American and California Government (D.1.) .....			3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3	3	
	19	19	17
Senior			
EL 401 Electromagnetic Fields II .....	3		
EL 414 Signal Processing in Communications .....	3		
EL 461, EL 462 Senior Project .....	2	2	
EL 463 Undergraduate Seminar .....	2		
<sup>2</sup> Approved technical electives .....	4	4	3
PHYS 412 Solid State Physics for Engineers .....	3		
PHYS 452 Solid State Physics Laboratory for Engineers .....		1	
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
IE 314 Engineering Economics .....			3
HIST 315 Modern World History (D.2.) .....			3
	17	16	15

See COURSES OF INSTRUCTION section of this catalog for description of courses in Electrical Engineering, Electronic Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> A minimum of 2 senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required.

# ENGINEERING SCIENCE

(An Interdisciplinary Program)

Coordinator, Gustav N. Wassel

The Bachelor of Science degree in Engineering Science is designed for those students seeking comprehensive education in the fundamental principles and concepts of general engineering systems as distinguished from specialization in one engineering discipline. It is a broad, flexible program in engineering which provides ample opportunity for each student (with aid from an adviser) to plan a program to meet personal career objectives. For example, a student can create excellent programs in engineering physics, automatic control systems, information systems, and bio-medical engineering systems.

The engineering sciences, which are based upon an extensive study of mathematics, physics, and chemistry, are (1) mechanics of solids and fluids, (2) electrical science including electric and magnetic fields, circuits, and electronics, (3) thermodynamics and statistical mechanics, (4) materials science, (5) information transmission, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes, including heat and mass transfer.

The curriculum provides ample electives for the selection of courses appropriate to the student's career objectives. Of the total 24 elective units, 18 are required to be chosen from a list of design, systems and synthesis courses.

Prior to the end of the first quarter of the junior year, the student will be required to submit to the Coordinator a "study plan" of electives. This plan must be consistent with a clearly defined career goal.

## CURRICULUM IN ENGINEERING SCIENCE

Freshman	F	W	S
CSC 101 Fortran Programming (F.1.) .....			2
<sup>1</sup> Manufacturing processes electives .....		2	2
EE 112 Basic Circuit Analysis .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....	4		
	<u>16</u>	<u>17</u>	<u>17</u>
Sophomore			
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
CE 204, CE 205, CE 206 Strength of Materials and Laboratory .....		3	3
EE 211, EE 241 Basic Electric Circuit Analysis and Laboratory .....	4		
EE 212, EE 242 Basic Electric Circuit Analysis and Laboratory .....		4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 317 Topics in Engineering Mathematics (B.2.) .....			4
PHYS 133 General Physics .....	4		
PHYS 210 Introduction to Modern Physics or PHYS 211 Modern Physics .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....			3
	<u>18</u>	<u>18</u>	<u>17</u>

	F	W	S
<b>Junior</b>			
EE 301 Network and System Analysis .....		3	
EE 341 Advanced Circuits Laboratory .....		1	
EL 208, EL 248 Electronic Devices and Laboratory .....			4
MET 306, MET 341 Materials Engineering and Laboratory .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
POLS 210 American and California Government (D.1.) .....	3		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
<sup>3</sup> Mathematics, statistics or computer science elective .....	3		
CSC 332 Numerical Analysis I .....			3
ME 302, ME 303 Thermodynamics .....	3	3	
ME 313 Heat Transfer .....		3	
ME 316, ME 317 Mechanical Vibrations and Laboratory .....	4		
IE 314 Engineering Economics .....			3
<sup>2</sup> Critical reading elective (C.1.) .....		3	3
	17	16	17
<b>Senior</b>			
MET 301 Physics of Metals .....		3	
<sup>4</sup> Senior Project .....		2	2
EE 302 and EE 342 or ME 422 Control systems elective .....	4		
PHIL 331/PHIL 335/PHIL 337/HUM 402 (C.3.) .....		3	
ME 341 Fluid Mechanics .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>5</sup> Technical electives .....	6	6	6
HIST 315 Modern World History (D.2.) .....	3		
Electives .....		3	3
	16	17	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering and other subjects.

<sup>1</sup> To be selected from ETMP 144, ETMP 145; ETWT 144, 152; ENGR 302.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> To be selected from MATH 312, MATH 319, MATH 405, MATH 408, STAT 321, CSC 311, CSC 331, CSC 333, CSC 360.

<sup>4</sup> To be selected in an appropriate engineering discipline.

<sup>5</sup> Technical elective units must be chosen with the approval of the adviser.

## ENGINEERING TECHNOLOGY DEPARTMENT

Department Head, William R. Backer

Franklin P. Abshire  
Ray R. Allen  
Kenneth L. Brown  
Archie D. Cheda  
Mark A. Cooper  
Franklin S. Crane  
Kim Davis

James R. Ehrenberg  
Willis Arnold Finchum  
Fred S. Friedman  
Gary A. Granneman  
Theodore G. Graves  
Michael Hawes  
Robert K. Janeway

Thomas D. Kay  
Karl D. Lilje  
John C. Peterson  
William J. Phaklides  
Robert L. Rogers  
Gregory R. Swank

The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is that part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

The engineering technologist is somewhat more specialized than the engineer, focusing on a technical field within a traditional discipline. This is done by selecting an option in the Engineering Technology Department and choosing complementary technical electives. Compared to engineering, there is less breadth and depth in underlying engineering sciences, mathematics, and basic sciences. There is more training in skills and knowledge related to production, design support, equipment selection and modification, service, and maintenance. Emphasis is given to application of existing technology.

The program is structured to optimize transfer credit from associate technology programs offered by the California community colleges. The majority of the students in the program have transferred from these institutions.

The curriculum begins with a core of courses including mathematics, science, drafting, manufacturing processes, and mechanical, electrical, and materials fundamentals. Each student selects an option (listed below) for specialization. Finally, technical electives are selected from four groups, with the adviser's approval, to permit individual career orientation. All five options are accredited by TAC/ABET.

The Bachelor of Science in Engineering Technology leads to careers in manufacturing, quality assurance, design support, field service, product testing and evaluation, maintenance, technical aspects of marketing, and other areas of technical support of engineering activity.

### CURRICULAR OPTIONS

#### Air Conditioning-Refrigeration Technology

Emphasizes heating, ventilating, air distribution controls, building sanitation, air conditioning and refrigeration systems; specifically, the areas of modern commercial, industrial and manufacturing system applications utilizing the latest energy conservation techniques.

#### Electronic Technology

Emphasizes application of state-of-the-art technology, both analog and digital, used in computers, controls, communications systems, industrial electronics, and instrumentation.

#### Manufacturing Processes Technology

Emphasizes the technologies of manufacturing systems, including computer aided methods, numerical control, production tooling and material handling, as well as the study of the processes and ancillary support systems of modern manufacturing.

#### Mechanical Technology

Emphasizes the application of current technology in support of design of mechanical equipment and systems; also fluid power, engines, process control, and product evaluation and modification.

#### Welding Technology

Emphasizes welding techniques, nondestructive testing, power sources, production equipment and problems, and welding process control in both construction and industrial environments.



## CURRICULUM IN ENGINEERING TECHNOLOGY

Freshman	F	W	S
ETEL 124 Introduction to Electronic Circuits .....	4		
ETEL 125 Introduction to Electronic Devices .....		4	
ETEL 126 Electrical Practices .....			4
<sup>1</sup> Manufacturing Processes electives .....	2	1	2
<sup>1</sup> Engineering drawing electives .....	2	1	1
MATH 120 College Algebra and Trigonometry .....	5		
MATH 131, MATH 132 Technical Calculus (B.2.) .....		4	4
PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
	17	17	15
Sophomore			
IE 222 Engineering Analysis .....		3	
ENGR 251 Digital Computer Applications (F.1.) .....	2		
ETME 205 Statics .....	3		
ETME 206 Dynamics .....		4	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....			4
PHYS 123 College Physics .....	4		
CHEM 121 General Chemistry (B.1.a.) .....		4	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
MET 235 Metallurgy for Engineering Technology .....			4
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>2</sup> Critical reading electives (C.1.) .....		3	3
Electives and courses to complete major .....	4		4
	17	17	18
Junior			
ETME 301 Thermodynamics .....	4		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
<sup>1</sup> Approved technical electives .....	3	3	4
Electives and courses to complete major .....	7	8	4
	17	17	17

	F	W	S
<b>Senior</b>			
ET 461, ET 462 Senior Project .....	2	3	
ET 463 Undergraduate Seminar .....	2		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....		3	
IE 314 Engineering Economics .....	3		
HUM 402 Human Values and Technology or PHIL 337 Professional Ethics (C.3.) .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Approved technical electives .....	4	4	4
Electives and courses to complete major .....	5	4	9
	16	17	16

### AIR CONDITIONING-REFRIGERATION TECHNOLOGY OPTION

(Add courses below to basic curriculum)

<b>Sophomore</b>			
ETAC 121 Air Conditioning and Re- frigeration Principles .....	(4)	ETAC 321 Air Distribution Systems .....	(3)
ETAC 123 Environmental Graphics .....	(2)	ETAC 331 Refrigeration Systems .....	(4)
Free electives .....	(2)	Free elective .....	(1)
<b>Junior</b>			
ETAC 201 Air Conditioning and Re- frigeration Codes .....	(5)	ETAC 332 Refrigeration Systems .....	(4)
ETAC 221 Mechanical Equipment of Buildings .....	(3)	ETAC 425, ETAC 426 Air Condition- ing Systems .....	(8)
ETAC 301 Computer Aided HVAC .....	(3)	ETAC 439 Instruments and Controls .....	(3)
		Free electives .....	(3)

### ELECTRONIC TECHNOLOGY OPTION

(Add courses below to basic curriculum)

<b>Sophomore</b>			
ETEL 218 Digital Circuits I .....	(3)	Free electives .....	(3)
ETEL 234 Passive Network Analysis .....	(4)		
Free elective .....	(1)		
<b>Junior</b>			
ETEL 232, ETEL 233 Electronic Cir- cuits and Devices .....	(8)	ETEL 334 Digital Circuits II .....	(4)
ETEL 311 Transmission Lines and Antennas .....	(4)	ETEL 335 Communications I .....	(4)
ETEL 312 Active Linear Circuits .....	(4)	ETEL 338 Introduction to Computer Technology .....	(4)
		ETEL 435 Communications II .....	(4)
		Free electives .....	(2)

<sup>1</sup> To be selected with approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and TAC/ABET requirements. Skills courses are not acceptable. (Please see page 47 of this catalog.)

**MANUFACTURING PROCESSES TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

ETMP 224 Advanced Machining Technology .....	(4)
ETMP 245 Advanced Machining Operations .....	(3)
Free elective .....	(1)

**Junior**

ETME 344 Advanced Design Drawing .....	(2)
ETMP 321, ETMP 322, ETMP 323 Tool Design .....	(9)
ETMP 325 Abrasive Machining and Finishing .....	(2)
IE 214 Production Control .....	(2)

IE 233 Computer Aided Manufacturing .....	(2)
Free electives .....	(2)

**Senior**

ETMP 336 Numerical Control Programming .....	(3)
ETMP 421 Computer Aided Manufacturing Technology .....	(3)
ETMP 434, ETMP 435, ETMP 436 Tool and Manufacturing Engineering .....	(9)
Free electives .....	(3)

**MECHANICAL TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

ETAC 221 Mechanical Equipment of Buildings .....	(3)
ENGR 302 Plastic Design .....	(2)
Free electives .....	(3)

**Junior**

ETME 320 Mechanisms .....	(3)
ETME 333 Industrial Hydraulics and Pneumatics .....	(4)
ETME 335 Selection of Engineering Materials .....	(2)
ETME 337 Instrumentation of Mechanical Systems .....	(3)

ETME 338 Industrial Engines .....	(4)
ETME 344 Advanced Design Drawing .....	(2)
Free elective .....	(1)

**Senior**

ETME 421, ETME 422 Applied Machine Design .....	(8)
ETME 437 Applied Fluid Power Systems .....	(4)
ETME 443 Mechanical Systems .....	(4)
Free electives .....	(2)

**WELDING TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

CHEM 122 General Chemistry .....	(4)
ETWT 224 Weld Evaluation Methods .....	(2)
ETWT 259 Advanced Welding .....	(2)

**Junior**

ETWT 324, ETWT 325, ETWT 326 Welding Technology .....	(12)
ETWT 335 Nondestructive Examination .....	(5)

Free electives .....	(2)
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**Senior**

ETWT 336 Welding Power Sources .....	(3)
ETWT 434, ETWT 435, ETWT 436 Advanced Welding Technology .....	(11)
Free electives .....	(4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering Technology and other subjects.

# INDUSTRIAL ENGINEERING DEPARTMENT

Department Head, Donald E. Morgan

J. Kent Butler  
H. JoAnne Freeman

James R. Golden  
Anthony K. Mason

Unny Menon  
A. Reza Pouraghabagher

Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic and by utilizing energy, materials, facilities, and personnel most effectively. Its objective is to improve quality and efficient production of goods and services for humankind and to act as the interface between technology and the human factor. Engineering methods and practical knowledge are used in formulating decision models for optimum application of management principles.

Industrial engineering graduates can choose from a most challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The curriculum leading to the Bachelor of Science in Industrial Engineering degree, accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, is oriented to provide graduates with the capability of producing results with a minimum of additional training. Graduates also are well prepared for successful postgraduate study. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. There are active student chapters of the American Institute of Industrial Engineers and Alpha Pi Mu, the national honorary society for industrial engineers.

Department and University laboratories and equipment, including computers and programmable processors, are integrated into course work from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

## CURRICULAR CONCENTRATIONS

### Production Management

A selection of courses stressing the management of the production process utilizing statistics, economics, operations research, social sciences, human factors, principles of management, and manufacturing methods.

### Systems Analysis

A selection of courses stressing the analysis and synthesis of systems. Mathematical and statistical models for management planning and control including the concepts of human factors, information theory, and data feedback as applied to productive systems.

## CURRICULUM IN INDUSTRIAL ENGINEERING

Freshman		F	W	S
IE 101	Introduction to Industrial Engineering .....	3		
IE 123	Industrial Systems Analysis .....		4	
IE 141	Manufacturing Processes .....	1		
ETMP 144	Manufacturing Processes .....			2
IE 223	Man-Machine Systems .....			4
ETME 142, ETME 143	Engineering Drawing Systems .....	1	1	
MATH 141, MATH 142, MATH 143	Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125	General Chemistry (B.1.a.) .....		4	4
ENGL 114	Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125	Critical Thinking (A.2.) .....		3	
BIO 220	Physiology and Biological Adaptation (B.1.b., E.2.) .....	4		
ENGL 218	Writing: Argumentation and Reports (A.4.) .....			4
		<hr/> 17	<hr/> 16	<hr/> 18

	F	W	S
<b>Sophomore</b>			
IE 251 Manufacturing Engineering Laboratory .....	4		
ETMP 145 Manufacturing Processes: Machining II or IT 141 Plastics Processes and Applications .....			1
IE 239 Industrial Costs and Controls .....		4	
IE 233 Computer Aided Manufacturing .....		2	
IE 334 CAD/CAM .....			3
ME 211 Engineering Statics .....			3
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
STAT 321 Statistical Analysis (B.2.) .....			3
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
POLS 210 American and California Government (D.1.) .....			3
ECON 201 Survey of Economics (D.3.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
ENGR 251 Digital Computer Applications (F.1.) .....	2		
	17	17	17
<b>Junior</b>			
IE 304, IE 405 Operations Research .....	3	3	
IE 343 Manufacturing Design .....			4
IE 319 Human Factors Engineering I .....	3		
IE 424 Engineering Test Design and Analysis .....	3		
IE 314 Engineering Economics .....			3
<sup>1</sup> Technical electives .....		7	3
CE 204 Strength of Materials .....	3		
ME 212 Engineering Dynamics .....		4	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....			4
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	4		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
	16	17	17
<b>Senior</b>			
IE 430 Statistical Quality Control .....	3		
IE 441, IE 442 Fundamentals of Supervision .....	2	1	
IE 461, IE 462 Senior Project .....	2	3	
IE 463 Undergraduate Seminar .....			2
ME 302 Thermodynamics .....		3	
ME 341 Fluid Mechanics .....			3
EL 321, EL 361 Electronics and Laboratory .....	4		
<sup>2</sup> Critical reading electives (C.1.) .....		4	4
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> Technical electives .....	3	3	3
SOC 105 Introduction to Sociology (D.4.) .....			3
	17	17	18

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Industrial Engineering and other subjects.

<sup>1</sup> A specific set of courses determined by concentration.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 47 of this catalog.)

## INDUSTRIAL TECHNOLOGY DEPARTMENT

Department Head, Laurence F. Talbott

William L. Bruckart  
Larry W. Gay  
Roger L. Keep

Lynn S. Mosher  
James L. Murphy  
Anthony J. Randazzo

Nelson L. Smith, III  
J. Edward Strasser  
Raymond A. Wysock

The Industrial Technology Department offers two degree programs: 1) Bachelor of Science in Industrial Technology, and 2) Master of Arts in Industrial Arts. This department also administers the Bachelor of Vocational Education program.

The Bachelor of Science program in Industrial Technology has two options which prepare graduates for employment in a broad range of professional positions in industry and education.

### CURRICULAR OPTIONS

#### Industrial Education

This option provides undergraduate professional preparation of industrial education teachers for secondary schools, community colleges, and industry. The curriculum provides for instruction and laboratory experiences in drafting, wood technology, industrial plastics, electricity, electronics, metal technology, power technology, automobiles, and graphic arts. Graduates of this option have an extensive understanding of industrial manufacturing procedures plus the ability to work well with students, helping them to become familiar with the processes of industry. The Single Subjects Credential (for secondary teaching) is available as part of this program. The Designated Subject Credential and the Bachelor of Vocational Education degree are administered under this option.

#### Industrial Management

This option emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Graduates in the field of industrial technology function in the mid-ground between the applied aspects of engineering and administration. Students who enjoy working primarily with people in solving technical problems are particularly well suited for careers in industrial technology. Preparation for professional specialization in industrial sales, production and quality management, or plant facilities management, is provided through the selection of appropriate electives.

### CURRICULUM IN INDUSTRIAL TECHNOLOGY

Freshman	F	W	S
IT 101 Technical Problem Solving .....	3		
ETME 142, ETME 143 Engineering Drawing Systems or IT 235 Industrial Drawing .....			2
<sup>1</sup> MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
GEOG 150 Human Geography (D.4.) .....		3	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
BIO 101 General Biology (B.1.b.) .....	3		
Electives and courses to complete option .....	<u>1</u>	<u>6</u>	<u>7</u>
	16	16	17

	F	W	S
<b>Sophomore</b>			
PSY 201/PSY 202 General Psychology (E.1.) .....			3
IT 237, IT 238 Industrial Electricity .....	3	3	
STAT 211 Elementary Probability and Statistics .....		3	
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ECON 211/ECON 212 Principles of Economics (D.3.) .....	3	3	
PE 250 Health Education (E.2.) .....			2
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
IT 229 Industrial Materials .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
Electives and courses to complete option .....			6
	16	16	17
<b>Junior</b>			
HIST 315 Modern World History (D.2.) .....	3		
GEOG 308 Global Geography (D.4.) .....	3		
IT 222 Power Technology .....		4	
IT 245 Technical Sketching .....		2	
IT 305 Technical Presentations .....		3	
IT 311 Plant Safety Fundamentals .....			3
IT 333 Electronic Computer Applications .....			4
IT 326 Product Development and Evaluation .....			3
CSC 101 Fortran Programming (F.1.) .....			2
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 315/PHIL 321/PHIL 331/PHIL 333/PHIL 335 (C.3.) .....	3		
Electives and courses to complete option .....	8	5	4
	17	17	16
<b>Senior</b>			
IT 433 Production and Process Management .....			3
IT 461, IT 462 Senior Project .....		2	2
IT 463 Industrial Technology Seminar .....	4		
HIST 204 Growth of American Democracy (D.1.) .....	3		
POLS 210 American and California Government (D.1.) .....			3
HUM 402 Human Values and Technology (C.3.) .....	3		
Electives and courses to complete option .....	6	15	9
	16	17	17

## INDUSTRIAL EDUCATION OPTION

(Add courses below to basic curriculum)

<b>Freshman</b>			
IT 125 Wood Processes .....	3	ED 405 Diagnostic, Prescription and Evaluation .....	2
<b>Sophomore</b>			
IT 250 Transportation and Power ....	4	ED 409 Teaching in the Secondary School .....	3
<b>Junior</b>			
IT 327 Plastics Technology .....	3	<b>Senior</b>	
IT 353 Furniture Design and Construction .....	3	IT 424 Curriculum and Methods of Industrial Education .....	3
ED 302 Multicultural Education in the Secondary School .....	3	IT 443 General Metals .....	3
ED 305 Teaching and Learning Processes .....	3	IT 444 Technical Drawing .....	3

<sup>1</sup> MATH 118 or MATH 119 or MATH 114 and MATH 115 may be used in lieu of Math 120.<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

# INDUSTRIAL MANAGEMENT OPTION

(Add courses below to basic curriculum)

Freshman <sup>1</sup>		Junior <sup>2</sup>	
Manufacturing Processes .....	1	IT 331 Industrial Electrical Systems ..	4
MATH 131 Technical Calculus .....	4	IT 332 Electronic Control Systems ..	4
Sophomore		Senior <sup>3</sup>	
ACTG 211 Financial Accounting for Nonbusiness Majors .....	4	MGT 311 Industrial Management ....	4
		IT 418 Technical Management Problems .....	4
		IT 431, IT 432 Mechanical Systems ..	4,4

# MASTER OF ARTS IN INDUSTRIAL ARTS

This program provides preparation for professional responsibilities including leadership in industrial education. It is designed to be of practical value to secondary school and community college instructors in industrial arts and trade-technical subjects. It also will aid those preparing for administrative positions in these areas. The program also meets the requirements for the permanent California Secondary Single Subject Teaching Credential. The master's degree in a subject field such as Industrial Arts is required for regular credentialing to teach at the community college level.

The curriculum includes opportunities for obtaining knowledge and skills at advanced levels in technical areas and covers aspects common to current industrial education in curriculum development, facilities, trends, organization, administration and research. Graduates are prepared to accept positions in industry as instructors and coordinators of industrial training programs.

# CURRICULUM FOR THE MASTER OF ARTS DEGREE

(For University requirements see *Graduate Studies Bulletin*)

Required:	Units
IT 515 History and Philosophy of Industrial Education .....	3
IT 520 Organization and Administration of Industrial Education .....	3
IT 521 Curriculum in Industrial Education .....	3
IT 522 Facility Planning in Industrial Education .....	3
IT 527 Trends and Issues in Industrial Education .....	3
IT 580 Graduate Research in Industrial Education .....	3
* IT 599 Industrial Education Thesis or Project .....	5 23
Courses in professional education at the 500 level chosen with approval of the adviser .....	9
Elective courses at the 400 and 500 levels, including a minimum of 6 additional units in industrial education, with adviser approval .....	13
	45

See COURSES OF INSTRUCTION section of the catalog for description of courses in Industrial Technology and other subjects.

<sup>1</sup> Free electives may be adjusted to 9 units.  
<sup>2</sup> Free electives may be adjusted to 5 units.  
<sup>3</sup> Free electives may be adjusted to 18 units.  
 \* The student may be permitted a nonthesis/project option by accomplishing all of the following steps:  
 1) Obtaining approval of the adviser and the Graduate Studies Committee. 2) Substituting 5 units of 500-level course work which support this professional degree and are approved in advance by the above committee. The following is recommended: IT 500 Individual Study (1-6). 3) Passing a comprehensive written examination covering the graduate program.



## METALLURGICAL AND WELDING ENGINEERING DEPARTMENT

Department Head, (Interim) George T. Murray

William D. Forgeng

Harry H. Honegger

Robert B. Leonesio

The Metallurgical and Welding Engineering Department prepares students for employment as metallurgical engineers, and also provides service courses in metallurgy to students in other departments. The Bachelor of Science degree in Metallurgical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It offers an opportunity to pursue specialized metallurgical areas on an elective basis in the senior year.

Students who graduate as metallurgical engineers can continue on to graduate school but most are employed by private industry and government agencies to deal with problems of design and manufacture of metals and alloys, corrosion protection, nondestructive testing, application of materials to specific needs and requirements including process development. Typical position titles are metallurgist, metallurgical engineer, corrosion engineer, plant metallurgist, materials engineer, welding engineer, nondestructive test engineer, and quality assurance engineer.

The Metallurgical and Welding Engineering Department is well equipped with various laboratories, including a welding development lab. There are two metallurgical engineering laboratories for student use. The metallography laboratory is equipped with the latest instruments for study of internal structures of metals and alloys. The metallurgy laboratory includes equipment for vacuum melting and processing, heat treatment, nondestructive testing, air melting furnaces, a corrosion laboratory, a physical testing laboratory and electron microscopy.

There is a student chapter of the national professional society, The American Society for Metals. The chapter offers an active program of professional and social activity.

### CURRICULUM IN METALLURGICAL ENGINEERING

Freshman	F	W	S
<sup>1</sup> Manufacturing processes electives .....	2		2
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131 General Physics (B.1.a.) .....			4
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ART 111 Introduction to Art (C.2.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
POLS 210 American and California Government (D.1.) .....		3	
HIST 204 Growth of American Democracy (D.1.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
	17	17	17
Sophomore			
MET 306, MET 341 Materials Engineering and Laboratory .....	4		
MET 222, MET 223 Physical Metallurgy .....		5	4
ENGR 251 Digital Computer Applications (F.1.) .....	2		
ME 211 Engineering Statics .....		3	
ME 212 Engineering Dynamics .....			4
CE 204 Strength of Materials .....			3
PHYS 132, PHYS 133 General Physics .....	4	4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....			4

## 210 Metallurgical and Welding Engineering

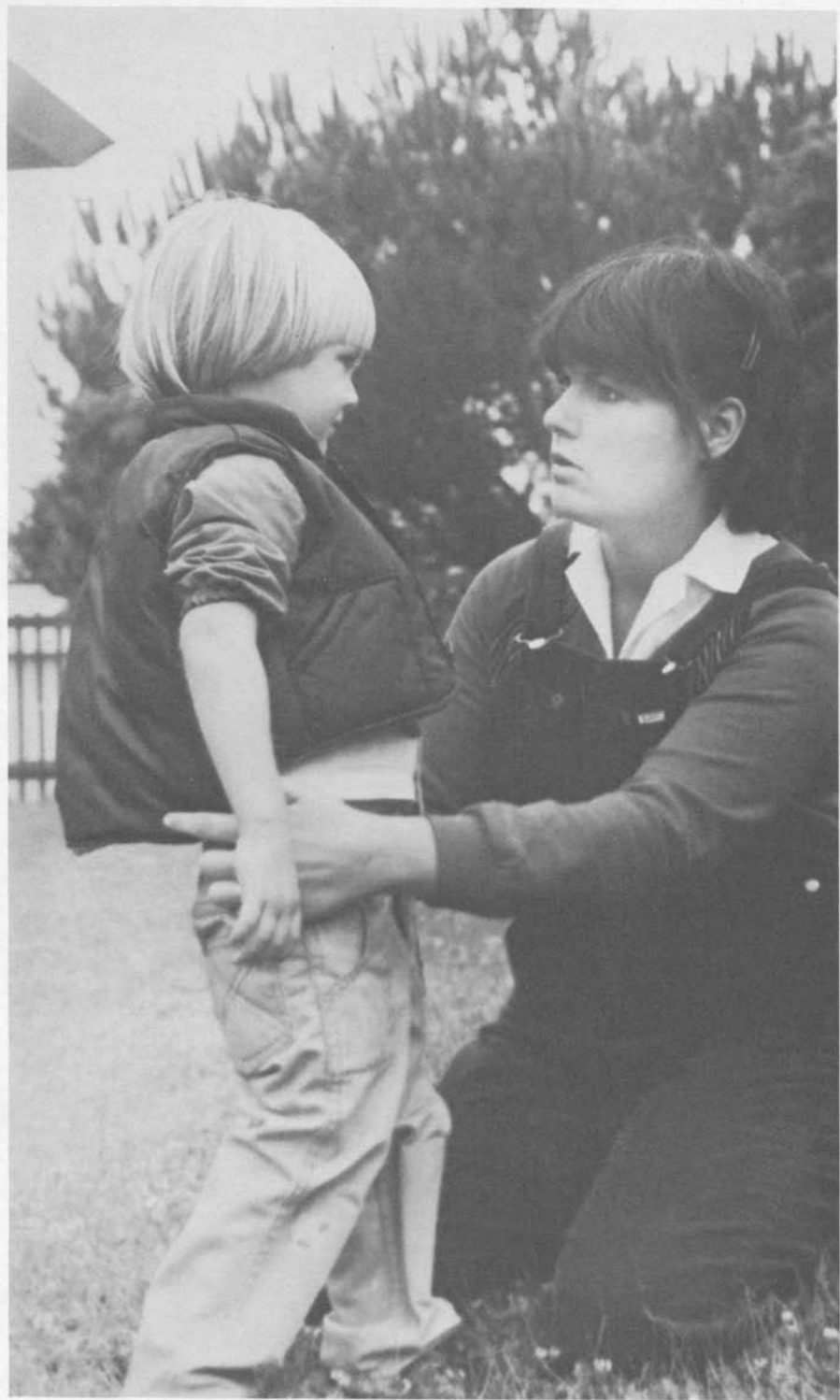
	F	W	S
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
	18	16	18
<b>Junior</b>			
MET 301 Physics of Metals .....	3		
MET 302, MET 303 Mechanical Metallurgy .....		4	4
MET 324, MET 325, MET 326 Metallurgical Engineering .....	4	4	4
CE 205 Strength of Materials .....	2		
CE 206 Strength of Materials Laboratory .....	1		
STAT 321, STAT 322 Statistical Analysis .....	3	3	
ME 313 Heat Transfer .....			3
CHEM 305, CHEM 306 Physical Chemistry (B.1.a.) .....		3	3
HIST 315 Modern World History (D.2.) .....		3	
ENGL 230/ENGL 231 Masterworks of English Literature or			
ENGL 240 The American Tradition in Literature (C.1.) .....	4		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....			4
	17	17	18
<b>Senior</b>			
MET 421, MET 422, MET 423 Metallurgical Thermodynamics .....	4	4	4
MET 424, MET 425, MET 426 Applied Metallurgical Engineering ..	3	3	3
MET 441, MET 442, MET 443 Metallurgy of Complex			
Alloys Laboratory .....	1	1	1
MET 434 Welding Engineering Laboratory .....	3		
MET 461, MET 462 Senior Project .....	2	2	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....		4	
Advanced technical topic .....			3
IE 314 Engineering Economics .....			3
HUM 402 Human Values and Technology (C.3.) .....			3
ECON 211 Principles of Economics (D.3.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
	16	17	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Metallurgical and Welding Engineering and other subjects.

<sup>1</sup> Select a total of 4 units from the following: ETWT 144; ETMP 144; ENGR 302.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and EAC-ABET requirements. (Please see page 47 of this catalog.)





# School of Human Development and Education

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## SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Harry J. Busselen, Dean (Interim)

Associate Dean (Position Vacant)

The School of Human Development and Education offers several major curricula leading to Bachelor of Science, Bachelor of Arts, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments of the University in offering experiences to students that enhance their general education.

Departments offering majors are Child Development and Home Economics, and Physical Education and Recreation Administration. The Psychology Department offers a wide range of electives for students majoring in other fields. Master's degrees are offered in Education, Home Economics, and Physical Education. The Bachelor of Arts in Liberal Studies is offered in connection with the teacher education program. The School, through the Education Department, assists in the coordination of a campus-wide teacher education program and in the preparation of individuals seeking teaching, counseling or administrative services, reading and special education specialist credentials.



The School has taken the leadership in the sponsorship or direction of numerous community oriented projects which are timed to meet social needs in cooperation with local, state and federal agencies.

The University supports a strong cocurricular program, and to this end the School of Human Development and Education provides valuable experience in intramural sports activities. Specialized cocurricular activities include: American Association of Fitness Directors in Business and Industry, American Home Economics Association, California Park and Recreation Society, California Association for Health, Physical Education and Recreation, Cal Poly Teachers Society, Council for Exceptional Children, Orchesis Dance Club, and Phi Upsilon Omicron (Home Economics).

## CHILD DEVELOPMENT AND HOME ECONOMICS DEPARTMENT

Department Head, Frances J. Parker

Robert L. Blodget	Basil A. Fiorito	Patricia Saam
Connie Breazeale	Lezlie A. Labhard	Ned W. Schultz
Sarah E. Burroughs	Karen S. Moerman	Josephine S. Stearns
Robert A. Christenson	Krishnakumar S. Morey	W. Fred Stultz
Sandra Crabtree	Ann Morgan	Bette W. Tryon
Patricia Engle	Mary E. Pedersen	Barbara P. Weber
David L. Englund	Mildred E. Roske	

Departmental curricula are designed to develop an understanding of the family ecosystem, the reciprocal relations of family to its natural and man-made environments, the effect of these singly or in unison as they shape the internal functioning of families and the interplays between the family and other social institutions and the physical environment. (*New Directions II*, AHEA 1975)

The department's curricula are multidisciplinary, incorporating course work from the arts, humanities, physical and social sciences. Persons with a general interest in home economics, dietetics or child and family development will attain a sound basis for successful personal, professional, and family life.

The Child Development and Home Economics Department offers four degree programs: a Bachelor of Science degree in (1) Child and Family Development, (2) Home Economics, (3) Dietetics and Food Administration and (4) a Master of Science degree in Home Economics. The Home Economics program is accredited by the American Home Economics Association. The dietetics program is approved by the American Dietetic Association. Applicants for admission must select one of the four majors.

### CHILD AND FAMILY DEVELOPMENT

Child and Family Development majors complete a core of common course work and then branch out into curricular concentrations in Child Development or Family Studies where unique competencies are attained. The department operates infant and preschool laboratory programs on campus and places upper-division students in San Luis Obispo County schools and agencies as part of the educational process.

#### Child Development Concentration

The Child Development concentration prepares men and women for teaching, caregiving, and administrative positions with public or private institutions in the U.S. or overseas, or for graduate work leading to college or university teaching or other professional positions requiring postbaccalaureate credentials. Child Development graduates may plan for careers in preschool and day-care settings, in multicultural programs and in other kinds of programs that serve infants, preschool and school-age children, adolescents, adults, and parents. Students may also pursue course work leading to the Multiple Subjects Credential program for public elementary school teachers.

#### Family Studies Concentration

The Family Studies concentration is an interdisciplinary program designed to provide the knowledge and experience necessary for a variety of careers in family, social service and counseling-related agencies in the public or private sectors. This concentration is particularly appropriate for students who wish to work in educational or helping agencies and who desire an individual or family developmental focus rather than a broad social science perspective at the undergraduate level. Many students in this concentration will pursue further graduate-level training in a variety of specializations.

### DIETETICS AND FOOD ADMINISTRATION

The Dietetics and Food Administration curriculum fulfills the academic requirements for admission to a dietetics internship or equivalency which must be completed before qualifying

for registration as a dietitian with the American Dietetics Association. It also prepares the graduate for careers in the field of food administration. Graduates are sought for administrative management, therapeutic, teaching, research, and public service positions in hospitals, clinics, schools, governmental agencies, and public eating facilities. Graduates are also prepared to pursue graduate studies in dietetics, foods or nutrition.

### HOME ECONOMICS

All Home Economics majors complete a basic core of professional, supportive and general education courses. Curricular professional preparations are available to students seeking careers in consumer affairs, foods, home economics, interior design, textiles and clothing/merchandising, and teacher education. Home economics is a "people profession." Generally home economists are employed in human services, education, business, industry, or research. They work with people of all ages in community settings including businesses, agencies, institutions, laboratories, playgrounds, or offices.

### CURRICULUM IN CHILD AND FAMILY DEVELOPMENT

Freshman	F	W	S
CFD 103 Pairing and Marriage .....	3		
CFD 108 Child, Family, and Community .....			3
ETHS 114 Racism in American Culture or ETHS 210 Cultural Heritage .....		3	
CFD 130 Beginning Study of Children and Families .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
Physical science (with laboratory) elective (B.1.a.) .....			4
BIO 101 General Biology (B.1.b.) .....	3		
MATH 114 College Algebra (B.2.) .....			3
ART 111 Introduction to Art or ART 112 Survey of Art History (C.2.) .....		3	
PE 280 Safety and First Aid .....	2		
<sup>1</sup> Electives and courses to complete major concentration .....		4	
	15	16	17
Sophomore			
CFD 203 Family Development .....	3		
CFD 125 Infant and Toddler Development .....	3		
CFD 225 Preschool and Middle Childhood Development .....		3	
CFD 229 Program Planning for Young Children .....			2
CFD 230 Intermediate Study of Children and Families .....			3
CFD 231 Seminar in Intermediate Study of Children and Families....			1
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
HIST 204 Growth of American Democracy (D.1.) .....	3		
DFA/HE 210 Nutrition (E.2.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....	3	3	
<sup>2</sup> Computer literacy elective (F.1.) .....			3
<sup>1</sup> Electives and courses to complete major concentration .....	1	1	1
<sup>3</sup> ANT/ED/HE/PSY/SOC electives (300-400 level) .....		3	3
	16	16	16



# Child Development and Home Economics 217

	F	W	S
<b>Junior</b>			
CFD 304 The Helping Relationship.....		3	
CFD 325 Adolescence.....			3
ECON 201/ECON 211/ECON 222 (D.3.) .....		3	
POLS 210 American and California Government (D.1.) .....			3
SOC 315 Race Relations (D.4.b.) .....	3		
HIST 315 Modern World History (D.2.) .....	3		
<sup>4</sup> DFA/HE 310 Maternal and Child Nutrition or			
HE 203 Consumer Role of the Family or			
HE 207 Problems of Family Housing .....	3		
MATH/STAT/physical or life science elective (B.1. or B.2.) .....		3	
BIO 302 Human Inheritance (B.1.b.) .....		3	
PSY 303 Human Sexuality .....	2		
CFD 329 Introduction to Research in Child and Family Studies .....			3
<sup>2</sup> Technology elective (F.2.) .....			3
<sup>1</sup> Electives and courses to complete major concentration .....	5	4	4
	16	16	16
<b>Senior</b>			
CFD 413 Parent-Child Relationships .....	3		
CFD 425 Adulthood and Aging.....			3
<sup>5</sup> CFD 461, CFD 462 Senior Project.....	2	3	
CFD 463 Undergraduate Seminar .....			2
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
<sup>3</sup> ANT/ED/HE/PSY/SOC electives (300-400 level) .....	3	3	3
<sup>1</sup> Electives and courses to complete major concentration .....	5	7	8
	16	16	16

<sup>1</sup> Of the total elective units, 21-24 shall be chosen in a field of concentration with the approval of the student's adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> Selected with the approval of the student's adviser.

<sup>4</sup> Child Development concentration take DFA/HE 310.

<sup>5</sup> Prerequisites: CFD 329, CFD 330 or CFD 453 or consent of instructor.

## CURRICULUM IN DIETETICS AND FOOD ADMINISTRATION

## Freshman

HE 122 Design Analysis .....	3		
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
ENGL 114 Writing: Exposition (A.1.) .....		4	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
SOC 105 Introduction to Sociology (D.4.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
POLS 210 American and California Government (D.1.) .....	3		
ANT 201 Cultural Anthropology .....			3
DFA 210 Nutrition (E.2.) .....		3	
ECON 201 Survey of Economics (D.3.) .....			3
Technology elective (F.2.) .....		3	
Electives .....	2	2	3
	15	16	15

## Sophomore

DFA 121 Fundamentals of Food .....	4		
ACTG 221, ACTG 222 Financial Accounting I and II .....		4	4
CSC 110 Computers and Computing or AM 250 Computer Application to Agriculture (F.1.) .....	3		
DFA 226 Home Food Conservation .....	2		
FDSC 209 Meat Procurement and Use .....		3	
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
ZOO 131 General Zoology (B.1.b.) .....		4	
CHEM 326 Survey of Organic Chemistry .....			4
BACT 221 General Bacteriology .....			4
MGT 206 Principles of Purchasing .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 202 Principles of Speech (A.3.) .....		3	
HE 203 Consumer Role of the Family .....		3	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
	16	17	18

## Junior

DFA 310 Maternal and Child Nutrition .....			3
DFA 321 Meal Management .....	3		
DFA 328 Advanced Nutrition .....		4	
DFA 348 Experimental Nutrition .....			2
ZOO 237 Human Anatomy and ZOO 238, ZOO 239 Human Physiology .....	3	3	3
CHEM 328 Biochemistry .....	4		
PSY 302 Behavior in Organizations .....	3		
ED 305 Teaching and Learning Processes .....		3	
MGT 313 Industrial Relations .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
ART/MU/TH elective (C.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
Electives .....			6
	19	16	17

	F	W	S
Senior			
DFA 415 Methods of Teaching Nutrition.....	3		
DFA 416 Community Nutrition .....		3	
DFA 421 Cultural and Aesthetic Aspects of Food .....			3
DFA 425 Quantity Food Preparation.....	3		
DFA 426 Food Systems Management.....		3	
DFA 427 Equipment and Layout .....			3
DFA 429 Diet Therapy .....	4		
DFA 461, DFA 462 Senior Project .....		3	3
HE 463 Undergraduate Seminar .....		2	
BACT 421 Food Microbiology .....	4		
HIST 315 Modern World History (D.2.) .....	3		
<sup>1</sup> Critical reading electives (C.1.) .....		6	
<sup>1</sup> Literature, philosophy, arts electives (300-400 level) (C.3.) .....			6
	17	17	15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)



CURRICULUM IN HOME ECONOMICS

Freshman	F	W	S
<sup>1</sup> CFD 108 Child, Family and Community .....		3	
HE 121 Fundamentals of Foods.....			4
HE 122 Design Analysis .....	3		
HE 220 Contemporary Textile Products.....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.) .....	3		
ART 111 Introduction to Art or			
ART 112 Survey of Art History (C.2.).....		3	
HE 101 Home Economics as a Profession.....	2		
SOC 105 Introduction to Sociology (D.4.).....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.).....		4	4
Electives .....	4	4	3
	16	17	17
Sophomore			
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
HE 203 Consumer Role of the Family.....	3		
STAT 211 Elementary Probability and Statistics (B.2.).....	3		
HE 207 Problems of Family Housing .....		3	
HE 210 Nutrition (E.2.) .....			3
CFD 203 Family Development.....			3
HE 242 Interior Design.....			4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
<sup>2</sup> Life sciences elective (BACT 221, BOT 121, ZOO 131, or BIO) (B.1.b.) .....		4	
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....		3	
Electives .....	4	3	3
	16	17	16
Junior			
HE 322 Textiles.....	3		
HE 324 Management of Family Resources .....			3
HE 326 Demonstration Techniques .....			3
HE 331 Household Equipment .....		4	
HIST 204 The Growth of American Democracy (D.1.) .....	3		
POLS 210 American and California Government (D.1.) .....		3	
HE 341 Dynamics of Clothing.....		3	
<sup>2</sup> Computer literacy elective (F.1.) .....			3
<sup>2</sup> Critical reading-English (C.1.).....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.).....			3
<sup>3</sup> Restricted electives .....	8	7	4
	17	17	16

	F	W	S
<b>Senior</b>			
HE 461, HE 462 Senior Project.....	3	3	
HE 463 Undergraduate Seminar .....	2		
HIST 315 Modern World History (D.2.) .....		3	
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> Technology elective (F.2.) .....			3
<sup>4</sup> Restricted electives .....	9	8	9
	17	17	15

### MASTER OF SCIENCE DEGREE

The Master of Science degree in Home Economics is designed to provide appropriate graduate level courses for: 1) professional competence for employment in business, community and family services, industry and teaching; 2) developing ability for self-directed study and growth; 3) up-grading professionals now in the field; 4) qualifying students for continued graduate work at other institutions.

### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

<b>Required:</b>	<b>Units</b>
HE 511 Research Design or	
ED 582 Investigative Techniques or	
ED 585 Research Methods in Education .....	3
HE 580 Seminar .....	3
HE 599 Thesis or additional approved course work and	
comprehensive examination .....	9
Courses in the general field of Home Economics selected from 500 series level .....	12
Courses in major area(s) of interest selected from 400 and 500 series level	
(or an approved related field) .....	12
Electives selected from 400 to 500 series level .....	6
	45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Child and Family Development, Dietetics and Food Administration, Home Economics, and other subjects.

<sup>1</sup> CFD 130 may be substituted with prior approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> To be selected with adviser approval. At least 6 units must have HE 300 series level prefix.

<sup>4</sup> To be selected with adviser approval. At least 3 units must have HE 400 series level prefix.

## EDUCATION DEPARTMENT

Department Head, Richard L. Warren

MaryLud Baldwin  
Donald Cheek  
John B. Connely  
Leonard Davidman  
Erland G. Dettloff  
Howard Drucker  
Margaret J. Glaser

Carolyn Hansen  
Jack B. Jones  
Robert L. Levison  
Ambrocio Lopez  
Donald K. Maas  
Susan L. McBride

Don M. Morris  
Dennis M. Nulman  
Louis D. Pippin  
Marilynn F. Rice  
David J. Sanchez  
Bernard A. Troy

The Education Department offers professional preparation course work which enables a student to complete the requirements for a preliminary credential in a single subject program (a secondary credential) or the multiple subject program (an elementary credential) simultaneous to the bachelor's degree. For specific single subject programs, see Teacher Preparation Programs in this catalog and then refer to the specific degree program listed. Students planning to teach in elementary school should refer to the degree program in Liberal Studies. Candidates may also enter the graduate program to complete the 45 quarter units of postgraduate work necessary for a clear credential.

Besides the basic teaching credentials, the Department has programs leading to specialist and service credentials in the areas of Administrative Services, Pupil Personnel Services (Counseling and Guidance), Reading Specialist, and Special Education Specialist—Learning Handicapped and Severely Handicapped. In addition to specialist and service credentials, it is possible to pursue either a Master of Science degree in Counseling or a Master of Arts degree in Education, with a specialization in Administrative Services, Counseling and Guidance, Curriculum and Instruction, Reading, Special Education, or the Special Interest Option. The Special Interest Option can be designed to meet a variety of student goals. See *Graduate Studies Bulletin* for further details or contact the Education Department.

A bilingual emphasis program is available for those who desire their course work to include preparation in the Spanish language.

The Education Department operates two clinics as a service to the community. The Reading Clinic, in conjunction with the Reading Specialist Program, provides diagnostic and remedial services for clients of school age, and also serves as a center for the latest equipment and instructional materials for the preparation of persons to teach reading. The Counseling and Guidance Clinic is staffed by graduate students under the supervision of Counseling and Guidance faculty members. Services are provided in family counseling, personal growth and communication skills.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Education, Liberal Studies, and other subjects.

## LIBERAL STUDIES

Interdisciplinary Program  
Coordinator, John B. Connely

The Bachelor of Arts in Liberal Studies is a degree major designed to provide undergraduate preparation for the student who intends to satisfy requirements for a teaching credential authorizing multiple subject instruction, i.e., elementary school teaching.

Students who find the teaching credential objective unrealistic after pursuing the Liberal Studies major to the point of entry into the University credential program or students who do not desire a teaching credential may complete a B.A. in Liberal Studies by satisfying the noncredential emphasis on the curriculum display below. Applications for or changes of major into the Liberal Studies major will be discouraged from any student who does not have the minimum scholastic standing (2.8 g.p.a.) overall and Cal Poly cumulative) necessary for successfully completing the multiple subjects teaching credential program as constituted on this campus.

### CURRICULUM IN LIBERAL STUDIES

Freshman	F	W	S
BIO 127, BIO 128, BIO 129 Natural History (B.1.b.) .....	3	3	3
MATH 114 College Algebra (B.2.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
Technology elective (F.2.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....			3
HIST 101/HIST 102/HIST 103 History of Western Civilization .....	3	3	
ART 111 Introduction to Art or			
ART 112 Survey of Art History (C.2.) .....	3		
Elective .....		2	
	16	14	15
Sophomore			
PSC 101, PSC 102 The Physical Environment (B.1.a.) .....	4	4	
PSC 303 Earth and Space Science .....			4
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 260 Children's Literature .....		3	
SPC 310 Performing Literature in the Classroom .....		3	
HIST 204 Growth of American Democracy (D.1.) .....	3		
ENGL 251/ENGL 252/ENGL 253 Great Books of World Literature			
(C.1.) .....	3		3
CSC 410 Computer Fundamentals for Educators (F.1.) .....			3
PE 250 Health Education (E.2.) .....	2		
Foreign language (one language) electives (C.3.) .....	5	5	2
	17	15	16

## NONCREDENTIAL EMPHASIS

Junior <sup>2</sup>

MATH 327, MATH 328, MATH 329 Modern Elementary Math (B.2.) .....	3	3	3
GEOG 308 Global Geography (D.4.) .....			3
ENGL 302 Advanced Composition or ENGL 392 Contemporary Grammar and Composition .....	4		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
HIST 315 Modern World History (D.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> ENGL/SPC restricted elective (300-400 level) (C.3.) .....		3	
MU 100 Music Fundamentals .....	3		
MU 301 Music for Children .....			3
MU 204 Appreciation of Music .....		3	
GEOG 340 Geography of California or HIST 385 Topics in California History .....		3	
Restricted electives .....			8
	16	15	17

## Senior

ART elective .....		3	
Restricted electives .....	6	9	13
LS 461 Senior Project .....	3		
TH 347 Children's Theatre .....	3		
Electives .....	3	3	2
	15	15	15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> Two emphases of at least 18 units must be acquired within the total degree program, at least 12 units of each emphasis must be 300-400 level course work. The two emphases and the courses are to be selected with the adviser's approval.





CREDENTIAL EMPHASIS

Junior	F	W	S
HIST 315 Modern World History (D.2.) .....	3		
MATH 327, MATH 328, MATH 329 Modern Elementary Mathematics .....	3	3	3
GEOG 308 Global Geography (D.4.) .....	3		
ENGL 302 Advanced Composition or ENGL 392 Contemporary Grammar and Composition .....	4		
MU 100 Music Fundamentals .....	3		
MU 204 Appreciation of Music .....		3	
MU 301 Music for Children .....			3
GEOG 340 Geography of California or HIST 385 Topics in California History .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
ED 305 Teaching and Learning Processes .....		3	
ED 401 Reading Methods in the Elementary School .....			3
ED 301 Multicultural Education in the Elementary School .....			3
ENGL/SPC elective (300-400 level) (C.3.) .....		3	
	16	18	15
Senior			
ED 411 Organization and Management in the Elementary School .....		3	
ED 410 Preliminary Student Teaching .....		6	
ED 420 Student Teaching .....			12
ED 408 Teaching Science and Social Science in the Elementary School .....	3		
ED 407 Teaching Language Arts in the Elementary School .....	3		
ED 421 Senior Project/Practicum (Multiple Subjects) .....			2
ED 402 Field Experience in Elementary School Reading .....	3		
TH 347 Children's Theatre .....	3		
ART elective .....	3		
Electives .....		6	
	15	15	14

## PHYSICAL EDUCATION AND RECREATION ADMINISTRATION DEPARTMENT

Department Head, Jimmy H. Railey

Doris Acord	Vaughan Hitchcock	Carolyn B. Shank
Katharine Barthels	Lynn M. Jamieson	Mary L. Stallard
Victor A. Buccola	Thomas J. Lee	Moon Ja Minn Suhr
F. Stuart Chestnut	Robert E. Meyers, Jr.	Michael Swiderski
Sonja M. Glassmeyer	Raymond Nakamura	James L. Webb
F. Sheldon Harden	Andrew J. Proctor	Marylinda Wheeler
Dwayne G. Head		

The Physical Education and Recreation Administration Department offers undergraduate degree programs in physical education and recreation administration with a graduate degree program in physical education. The department also contributes to the general education and elective needs of all students through the provision of health education, physical education activity, safety, and first aid courses.

Because of an ideal geographical location, the University has become a center for workshops held by the health and physical education organizations of the State.

The Physical Education building provides facilities for all phases of the total program including intercollegiate athletics. The main gymnasium has a championship basketball court, three intramural basketball courts, several volleyball and badminton courts, a wrestling room, a weight training area, and human performance laboratories. Crandall Gym also provides facilities for dance, swimming and gymnastics.

Extensive outdoor facilities include a number of turfed areas for physical education classes and recreational sports activities. A football stadium, regulation baseball diamond with permanent stands, and a quarter-mile track provide facilities for intercollegiate teams. An additional track is available for instructional and recreational activities. Basketball, volleyball, racquetball, shuffleboard, tennis courts with outdoor lighting, and a competitive swimming pool are used for instruction and recreation.

### PHYSICAL EDUCATION

The Bachelor of Science in Physical Education offers options in teaching, athletic coaching, and health education. An approved program of courses is available to those seeking an Adapted Physical Education Credential. The department also offers students the opportunity to pursue other physical education careers through an individualized course of study or department certificate programs such as public/private fitness or dance. Those who complete the Bachelor of Science program qualify for positions in secondary schools, governmental agencies, sports clubs, youth clubs, schools for the handicapped, industrial fitness centers, and the armed forces.

### RECREATION ADMINISTRATION

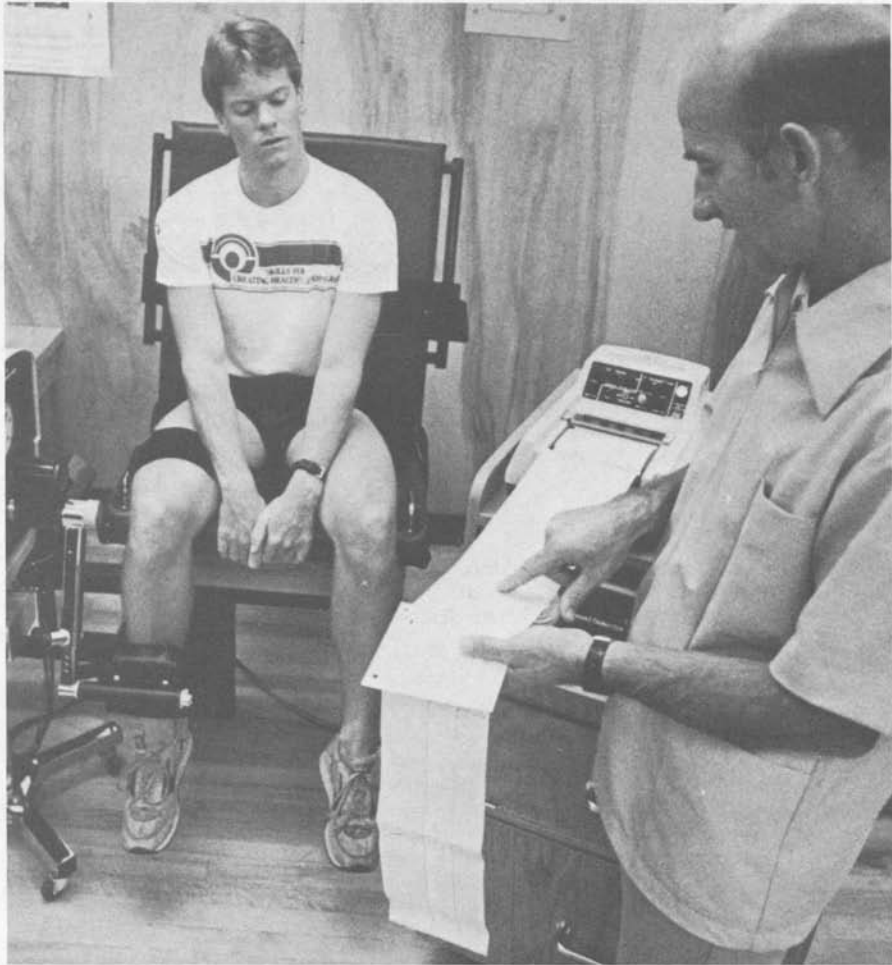
The Bachelor of Arts in Recreation Administration offers professional preparation for employment in public, private, and commercial leisure service organizations. Students may pursue a concentration in therapeutic recreation, private/commercial recreation or elect to have an emphasis in selected programming areas. A concentration in therapeutic recreation prepares students for employment in recreation therapy, leisure education for the disabled, and special recreation in such settings as hospitals, correctional institutions, health organizations and residential care facilities. The private/commercial recreation concentration emphasizes preparation for employment in agencies providing leisure products or services.

## CURRICULUM IN PHYSICAL EDUCATION

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.) .....	3		
PE 250 Health Education (E.2.) .....			2
PE 206-229 Professional activity elective.....		2	2
<sup>1</sup> Physical sciences elective (B.1.a.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
ZOO 131 General Zoology (B.1.b.) .....	4		
PE 270 Introduction to Physical Education .....	2		
PE 274 History and Philosophy of Physical Education .....		3	
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
PE 280 Safety and First Aid .....	2		
SPC 202 Principles of Speech (A.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Computer literacy elective (F.1.) .....			3
Electives and courses to complete major .....	2	2	1
	17	16	17
Sophomore			
PE 218 Aquatics.....		2	
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
STAT 212 Statistical Methods (B.2.) .....		3	
PE 206-229 Professional activity elective.....		2	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
PE 206 Tumbling-Vaulting or			
PE 207 Apparatus .....			2
PE 244 Introduction to Dance .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
ZOO 237 Human Anatomy and			
ZOO 238, ZOO 239 Human Physiology .....	3	3	3
PE 252 Beginning Athletic Training .....	2		
HE 210 Nutrition (E.2.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
Electives and courses to complete major .....	2	3	6
	17	16	17
Junior			
<sup>2</sup> ENGL 302 Composition or			
ENGL 310 Corporate Communications .....	4		
ZOO 340 Human Muscle Anatomy (B.1.b.) .....	2		
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
PE 302 Mechanical Kinesiology .....		3	
HIST 315 Modern World History (D.2.) .....			3
PE 303 Physiology of Exercise.....			3
PE 319 Tests and Measurements in Physical Education .....	3		
PE 402 Introduction to Motor Learning .....		3	
ENGL 251/ENGL 252/ENGL 253/Great Books of World			
Literature (C.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
Electives and courses to complete major .....	4	5	8
	16	17	17

	F	W	S
Senior			
PE 406 Adaptive Physical Education .....			3
PE 461, PE 462 Senior Project .....	3	2	
PE 401 Organization and Administration of Health and Physical Education.....	3		
PHIL 331 Ethics (C.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.).....		3	
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>1</sup> Technology elective (F.2.) .....		3	
Electives and courses to complete major .....	8	8	9
	17	16	15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)  
<sup>2</sup> Students in teaching option must take ENGL 302.



**ATHLETIC COACHING OPTION**

(Add courses below to basic curriculum)

**Junior**

REC 105, PSY 302 or Coaching Theory courses (with adviser approval) .....	(15)	PE 432 Athletic Training and Rehabilitation .....	(2)
PE 278, PE 290, PE 292, PE 294, PE 297, PE 298 Officiating .....	(3)	PE 437 Directed Field Work .....	(6)
<b>Senior</b>		JOUR 312 Introduction to Public Relations .....	(3)
PE 410 Psychology of Coaching .....	(3)		

**HEALTH EDUCATION OPTION**

(Add courses below to basic curriculum)

**Freshman**

PE 254 School Health Program .....	(2)
CFD 108 Child, Family, and Community or	
SOC 206 The Sociology of Family Life .....	(3)

**Sophomore**

BIO 253 Orientation to the Health Professions .....	(1)
or SOC 377 Medical Sociology .....	(3)
BACT 221 General Bacteriology .....	(4)
GEOG 320 Geography of Hunger .....	(3)

**Junior**

BIO 301 Human Ecology .....	(3)
PSY 301 Psychology of Personal Development .....	(3)
PSY 303 Human Sexuality .....	(2)
SOC 344 Sociology of Poverty .....	(3)

**Senior**

PSY 320 Behavioral Effects of Drugs and Alcohol .....	(3)
BIO 302 Human Inheritance .....	(3)
PE 405 Administration of Health Education .....	(2)
CFD 425 Adulthood and Aging or	
PSY 459 Lifespan Development ....	(3)

**TEACHING OPTION**

(Add courses below to basic curriculum)

**Freshman**

PE 206-229 Professional activity elective .....	(2)
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**Sophomore**

PE 206 Tumbling-Vaulting or	
PE 207 Apparatus .....	(2)
REC 260 Intramural/Recreational Sports .....	(3)
PE 278, PE 290, PE 292, PE 294, PE 297, PE 298 Officiating .....	(1)
PE 296 Planning Techniques in Physical Education .....	(3)

**Junior**

PE 332 Elementary School PE .....	(3)
PE 312, PE 356, PE 379, PE 381, PE 383 Teaching Methods .....	(9)
PE 375 Teaching Team and Individual Sports .....	(3)
PE 424 Organization and Teaching Physical Education .....	(3)

**Senior**

PE 440 Physical Education Practicum .....	(3)
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**CERTIFICATE PROGRAMS/INDIVIDUALIZED COURSE OF STUDY**

Students may pursue preparation for other physical education careers such as dance or public/private fitness, by completing 27-39 units in either approved departmental certificate programs or an individualized course of study.

## CURRICULUM IN RECREATION ADMINISTRATION

Freshman	F	W	S
REC 101 Introduction to Recreation and Leisure Services .....	3		
REC 103 Outdoor Recreation Skills .....	3		
REC 105 Recreation Leadership .....		3	
BIO 127/BIO 128/BIO 129 Natural History (B.1.b.) .....	3		
CSC 110 Computers and Computing (F.1.) .....		3	
ACTG 211 Financial Accounting for Nonbusiness Majors .....			4
BUS 101 The Business Enterprise .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
PE 143 Advanced Lifesaving or department approved elective .....	1		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
MATH 114 College Algebra (B.2.) .....		3	
<sup>1</sup> Physical or life sciences elective (B.1.) .....	3		
<sup>2</sup> Physical sciences elective (B.1.a.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>3</sup> Electives and courses to complete concentration .....		4	
	17	16	14
Sophomore			
REC 210 Programming for Leisure .....			3
REC 252 Recreation for People with Disabling Limitations .....		4	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
GEOL 201 Physical Geology (B.1.a.) .....	3		
PE 250 Health Education (E.2.) .....		2	
REC 260 Intramural/Recreational Sports .....	3		
PE 280 Safety and First Aid .....			2
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
POLS 210 American and California Government (D.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....	3		
<sup>3</sup> Electives and courses to complete concentration .....	2	3	3
	14	16	17
Junior			
REC 310 Program Administration in Leisure Services .....			3
REC 323 Supervisory Roles in Recreation Administration .....	3		
REC 324 Organizational Patterns of Recreation Administration .....		3	
REC 337 Implementation of Outdoor Recreation Programs .....			3
REC 364 Commercial Recreation and Leisure Services .....		3	
OH 337 Park Planning and Management or			
NRM 412 Planning for Parks in Wildland Areas .....	4		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
Economics elective (D.3.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
<sup>3</sup> Electives and courses to complete concentration .....	3	2	4
	16	14	16

	F	W	S
<b>Senior</b>			
REC 369 Research in Recreation Administration .....	3		
REC 416 Physical Education/Recreation Facilities .....	3		
REC 424 Management of Recreation and Leisure Services .....		3	
REC 430, REC 431 Directed Field Experience .....	3		3
REC 457 Leisure Counseling .....			3
REC 461, REC 462 Senior Project .....		3	2
<sup>2</sup> Technology elective (F.2.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>3</sup> Electives and courses to complete concentration .....	2	4	8
	14	16	16

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

<b>Required:</b>	<i>Units</i>
PE 502 Seminar in Problems of Physical Education .....	3
PE 513 Evaluation of Current Studies .....	3
PE 517 Research Methods in Physical Education .....	3
PE 525 Human Performance and Learning .....	3
	12
<b>Select 9 units with adviser approval from the following:</b>	
PE 511 Administration of Physical Education .....	3
PE 512 Critical Health Issues .....	3
PE 522 Biomechanics .....	3
PE 526 Sports in American Society .....	3
PE 530 Advanced Physiology of Exercise .....	3
	9
<b>Additional Physical Education electives:</b>	
A minimum of nine additional graduate level units must be taken in Physical Education. ....	
	9
<b>Electives (selected with adviser approval):</b>	
A maximum of fifteen units may be taken outside the Physical Education and Recreation Administration Department in 400- and 500-level courses. Up to nine units may be taken at the 400 level. Nine units of adviser approved 400 level Physical Education courses may be taken. ....	
	15
	45

For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physical Education, Recreation Administration and other subjects.

<sup>1</sup> Therapeutic Recreation students take ZOO 131 (4) as a concentration requirement.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> Minimum of 6 units must be at 300-400 level.

## PSYCHOLOGY DEPARTMENT

Department Head (Interim), Charles M. Slem

William D. Curtis  
M. Dale Federer

Daniel Hawthorne  
Linden L. Nelson

Peter Rabe  
Kathleen Ryan

The Psychology program is designed to acquaint students with the facts, theories, and contemporary trends in psychology. The application of psychological principles to existing personal, social, and technological problems is emphasized throughout the department courses. Attention is placed upon individual student development of a more coherent and meaningful understanding of oneself and of one's interactions with others and with the environment.

The Psychology Department contributes to the overall academic community through its participation in the general education program, as a source of electives for the various major areas, and as a resource for increased self-awareness and development.

Psychology seeks to identify, describe, and understand the many types of activities of which the human organism is capable.







# School of Science and Mathematics

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## SCHOOL OF SCIENCE AND MATHEMATICS

Philip S. Bailey, Dean (Interim)

Harry L. Fierstine, Associate Dean (Interim)

The School of Science and Mathematics offers curricula leading to the Bachelor of Science degree in Biochemistry, Biological Sciences, Chemistry, Computer Science, Environmental and Systematic Biology, Mathematics, Microbiology, Physical Science, Physics, and Statistics. Graduate programs are offered leading to the Master of Science degree in Biological Sciences, Chemistry, Computer Science, and Mathematics. The Reserve Officer Training Corps (ROTC) program is made available to all students of the University through the Military Science Department.



Courses offered by the School of Science and Mathematics meet the needs of several groups of students:

1. Students working toward Bachelor of Science, or Master of Science degrees with majors in science and mathematics.
2. Students from all majors who need to meet the requirements in General Education. These courses are required so that every graduate will be better prepared to be a participating citizen and a productive member of the state, nation, and world.
3. Students in Agriculture and Natural Resources, Architecture and Environmental Design, Business, Communicative Arts and Humanities, Engineering and Technology, Human Development and Education, and Science and Mathematics who require competency in subjects which support, complement, or are closely related to their areas of specialization.
4. Students planning to become elementary, secondary, or community college teachers, who need background in science and mathematics.
5. Students who need science and mathematics background in pre dentistry, pre medicine (and allied fields) and preveterinary science. A Health Professions Guidance and Evaluation Committee is prepared to advise, assist, and evaluate all students, regardless of major, who plan to enter the health professions.

The School of Science and Mathematics and the School of Human Development and Education cooperate to recommend candidates for the California Teaching Credential with majors in Biological Sciences, Mathematics, and Physical Science.

## BIOLOGICAL SCIENCES DEPARTMENT

Department Head, V. L. Holland

Frederick P. Andoli	Randolph L. Grayson	Maria E. Ortiz
Paraschos Babos	John K. Hampton, Jr.	Lee R. Parker
James S. Booth	Dennis N. Homan	Pratapsinha C. Pendse
Leslie S. Bowker	C. Dennis Hynes	Elizabeth K. Perryman
Robert J. Brown	Peter Jankay	Richard A. Pimentel
Raul J. Cano	Eric V. Johnson	Thomas L. Richards
Fred L. Clogston	David Keil	Rhonda L. Riggins-Pimentel
Jaime S. Colomé	George N. Knecht	Aryan I. Roest
Alan F. Cooper	Richard J. Krejsa	Shirley R. Sparling
Alvin A. DeJong	A. Mark Kubinski	William D. Stansfield
Douglas D. Donaldson	Kingston L. Leong	John W. Thomas
Harry L. Fierstine	Malcolm G. McLeod	William Thurmond
Dennis F. Frey	David H. Montgomery	Dirk R. Walters
Roger D. Gambs	Royden Nakamura	Archie Waterbury
David V. Grady	Richard F. Nelson	Michael A. Yoshimura
Constance H. Gray		

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Environmental and Systematic Biology, and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, a variety of courses is offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met for an academic major in biological sciences leading to credentials in secondary teaching.

### CURRICULUM IN BIOLOGICAL SCIENCES

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward postbaccalaureate studies, and for technical competency in the concentrations offered. A list of courses for the various concentrations is available in the department office.

## CURRICULAR CONCENTRATIONS

**Anatomy-Physiology**

This concentration is designed for students who are interested in zoology with an emphasis in the structure and function of animals. Preprofessional students of the health sciences would select this concentration.

**Biology**

The general biology program is designed for the student who wants the broadest possible training.

**Botany**

Plant structure, physiology, ecology, diseases and classification are the basis for courses leading to competency required for persons desiring positions as botanists.

**Marine Biology**

Students in this concentration may look forward to occupational and professional work in the field of oceanographic studies and enterprises.

**Plant Pathology-Entomology**

Students are trained to recognize, evaluate and solve plant disease and insect problems. They may be employed as technicians in research or extension service, or may continue their studies at the graduate level.

Freshman	F	W	S
BOT 121, BOT 122 General Botany and			
BOT 123 Introductory Plant Taxonomy or			
ZOO 131, ZOO 132, 133 General Zoology (B.1.b.) .....	4	4	4
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
CHEM 326 Survey of Organic Chemistry .....			4
ENGL 114 Writing: Exposition (A.1.) .....		4	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2) .....		3	
<sup>2</sup> MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
	16	15	15
Sophomore			
ZOO 131, ZOO 132, ZOO 133 General Zoology or			
BOT 121, BOT 122 General Botany and			
BOT 123 Introductory Plant Taxonomy .....	4	4	4
BACT 221 General Bacteriology .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
PHYS 121, PHYS 122, PHYS 123 College Physics .....	4	4	4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
ECON 201 Survey of Economics (D.3.) .....			3
HE 210/PE 250/PSY 304 elective (E.2.) .....			2-3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
<sup>3</sup> Electives and courses to complete major .....			3
	16	17	16-17

	F	W	S
<b>Junior</b>			
BIO 325 General Ecology .....			3
BIO 303 Genetics .....	3		
ENGL 302 Advanced Composition or ENGL 318 Writing for Scientific Journals .....			3-4
POLS 210 American and California Government (D.1.) .....	3		
<sup>4</sup> CSC 110 Computers and Computing (F.1.) .....		3	
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts (300-400 level) elective (C.3.) .....		3	
BIO 461 Senior Project .....			3
CHEM 328 Biochemistry (B.1.a.) .....	4		
BIO 431 Physiology I: General .....		4	
LIB 301 Library Resources and Literature Searches .....		1	
<sup>1</sup> Electives and courses to complete major .....	4	3	4
	17	17	16-17



<b>Senior</b>			
ENT 326 General Entomology .....	4		
BIO 462 Senior Project .....		2	
<sup>1</sup> Technology elective (F.2.) .....			3
BIO 423 General Cytology .....	4		
<sup>1</sup> ANT/BUS/ECON/GEOP/POLS/SOC elective (D.4.) .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
<sup>1</sup> Electives and courses to complete major .....	4-6	10	12
	15-17	18	18

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> MATH 118 and MATH 119 or MATH 141 will substitute.

<sup>3</sup> Of the total elective units 18 shall be chosen in a field of concentration in the Biological Sciences with adviser approval and 2-3 units at 300-400 level of an approved Biological Sciences elective. Additional information is available from the department.

<sup>4</sup> CSC 101 will substitute. (6 units must be taken from GEB Category F.)

## CURRICULUM IN ENVIRONMENTAL AND SYSTEMATIC BIOLOGY

The four-year program in Environmental and Systematic Biology leads to a Bachelor of Science degree. Emphasis is placed on providing the student with training in the identification and understanding of living organisms which form the human environment, and their relationship to each other and to mankind. An environmental or systematic biologist can look toward employment with government agencies and private industries which are involved with the environment—agriculture, forestry, wildlife management, parks and recreation, and environmental monitoring agencies, or may enter the educational field. The requirements of the degree program provide the basics for a wide range of job opportunities.

Freshman	F	W	S
ZOO 131, ZOO 132, ZOO 133 General Zoology (B.1.b.) .....	4	4	4
<sup>1</sup> CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
ENGL 114 Writing: Exposition (A.1.) .....		4	
<sup>2</sup> MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
STAT 212 Statistical Methods .....			3
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
SS 121 Soils (F.2.) .....	4		
<sup>4</sup> Electives and courses to complete major .....			3
	17	15	17
Sophomore			
BOT 121, BOT 122 General Botany and			
BOT 123 Plant Taxonomy .....	4	4	4
ZOO 329 Vertebrate Field Zoology .....			4
<sup>5</sup> PHYS 104 Introductory Physics (B.1.a.) .....	4		
GEOL 201 Physical Geology .....		3	
PHIL 125 Critical Thinking (A.2.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
CSC 110 Computers and Computing (F.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>4</sup> Electives and courses to complete major .....	3		4
	17	17	15
Junior			
BIO 303 Genetics .....	3		
BIO 315 Evolution .....		3	
BIO 325 General Ecology .....	3		
BOT 326 Plant Ecology .....			4
ENT 326 General Entomology .....	4		
BOT 333 Field Botany .....			4
BIO 461 Senior Project .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>3</sup> Critical reading elective (C.1.) .....		3	
<sup>4</sup> Electives and courses to complete major .....		3	2
	16	15	16



	F	W	S
<b>Senior</b>			
BIO 431 Physiology I: General .....	4		
ZOO 437 Animal Behavior .....	4		
BIO 462 Senior Project .....	2		
BIO 463 Undergraduate Seminar .....		2	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>1</sup> Literature, philosophy, arts (300-400 level) electives (C.3.) .....		3	3
PSY 304 Comparative and Physiological Psychology (E.2.) .....			3
<sup>4</sup> Electives and courses to complete major .....	6	7	6
	16	15	15

<sup>1</sup> CHEM 127, CHEM 128, CHEM 129 and CHEM 328 are recommended for students planning postgraduate training.

<sup>2</sup> MATH 118 and MATH 119 or MATH 141 will substitute.

<sup>3</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>4</sup> Of the total elective units, 6 must be selected from each of two specified lists; additional information available from the department.

<sup>5</sup> PHYS 121, PHYS 122, PHYS 123 are recommended substitutes for students planning postgraduate training.



## CURRICULUM IN MICROBIOLOGY

The undergraduate program leading to the Bachelor of Science degree in Microbiology involves the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

## CURRICULAR OPTIONS

## General Microbiology

This option provides students with basic concepts in microbiology along with practical skills. Graduates are prepared to enter positions in industry, various areas of research, public health, teaching, and advanced degree programs.

## Medical Laboratory Technology

This option prepares students specifically for careers in medically oriented fields: immunology, medical bacteriology, medical mycology, virology, parasitology, hematology, and genetics.

## Freshman

	F	W	S
ZOO 131, ZOO 132 General Zoology or			
BOT 121, BOT 122 General Botany (B.1.b.) .....	4	4	
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
<sup>1</sup> MATH 118 Pre-Calculus Algebra (B.2.) .....		4	
MATH 119 Pre-Calculus Trigonometry or			
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
HIST 204 Growth of American Democracy (D.1.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
POLS 210 American and California Government (D.1.) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
CSC 110 Computers and Computing (F.1.) .....			3
	15	15	16

## Sophomore

BOT 121, BOT 122 General Botany or			
ZOO 131, ZOO 132 General Zoology (B.1.b.) .....		4	4
<sup>3</sup> CHEM 326 Survey of Organic Chemistry .....	4		
BACT 224, BACT 225 General Microbiology .....	4		4
PHYS 121, PHYS 122, PHYS 123 College Physics .....	4	4	4
<sup>2</sup> Critical reading elective (C.1.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
Electives and courses to complete major .....		4	2
	16	15	17

	F	W	S
<b>Junior</b>			
CHEM 331 Quantitative Analysis .....	5		
<sup>4</sup> CHEM 371 General Biochemistry (B.1.a.) .....	4		
BIO 303 Genetics .....		3	
BIO 431 Physiology I: General .....		4	
BACT 402 General Virology .....			3
<sup>2</sup> Literature, philosophy, arts (300-400 level) elective (C.3.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
Electives and courses to complete major .....	5	4	2
	17	17	17
<b>Senior</b>			
ZOO 426 Serology and Immunology .....	4		
BACT 423 Medical Microbiology .....		4	
BACT 424 Bacterial Cytology and Physiology .....			4
BIO 304 Molecular Genetics .....	3		
BIO 461 Senior Project .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>2</sup> Technology elective (F.2.) .....		3	
HE 210/PE 250/PSY 304 elective (E.2.) .....			2-3
Electives and courses to complete major .....	8	7	7-8
	18	17	17

### GENERAL MICROBIOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

Junior and Senior Years

BACT 333 Industrial Microbiology .. (4)	CHEM 373 General Biochemistry III (3)
BACT 342 Sanitary Microbiology .... (4)	CHEM 374 Biochemistry Laboratory (2)
BACT 421 Food Microbiology .....	Take one of the following: BACT 403
BACT 436 Microbial Ecology .....	General Virology Lab or BIO 463 Un-
BIO 423 General Cytology .....	dergraduate Seminar .....
CHEM 372 General Biochemistry II (3)	(2)

### MEDICAL LABORATORY TECHNOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

Sophomore

BIO 321 Biological Instrumentation .. (3)	CHEM 335, CHEM 336 Clinical
	Chemistry .....
	Chemistry of Drugs and
Junior and Senior Years	Poisons..... (3)
BACT 430 Medical Mycology .....	ZOO 412 Introduction to Clinical
BIO 255 Microtechnique (2) or	Pathology .....
BIO 462 Senior Project (2) or	ZOO 425 Parasitology .....
BACT 403 General Virology	ZOO 428 Hematology .....
Lab (2) .....	(4)

<sup>1</sup> MATH 120 and STAT 211 or MATH 141 and STAT 211 will substitute.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> CHEM 316 and CHEM 317 will substitute for CHEM 326. (Substitution strongly recommended for students in the General Microbiology Option.)

<sup>4</sup> CHEM 328 may be substituted for Medical Laboratory Technology Option only.

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

Two approaches to the M.S. degree in Biological Sciences are possible; one involving only course work and a comprehensive examination, the other involving course work and a thesis. At least 22½ units of the minimum required 45 units must be at the 500 (graduate) level. All units selected must be acceptable for graduate credit. For further information, students should communicate with the head of the Biological Sciences Department.

Units

Courses in the biological sciences selected from 400- and 500-level courses. At least three units each selected from courses having three of the following prefixes: BACT, BIO, BOT, CONS, ENT, ZOO .....		27
BIO 590 Seminar in Biology .....		3
BIO 599 Thesis or additional course work with comprehensive examination .....		9
Electives from 400- and 500-level courses .....		6
		<hr/> 45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Bacteriology, Biology, Botany, Conservation, Entomology, Zoology and other subjects.

## CHEMISTRY DEPARTMENT

Department Head, William Rife

Linda Atwood	John W. F. Goers	Dennis R. Phillips
Christina A. Bailey	Jerome F. Houlis	Michael G. Silvestri
Philip S. Bailey	Ralph A. Jacobson	Jan W. Simek
Albert C. Censullo	Dane R. Jones	Russell L. Tice
Robert S. Cichowski	James Y. Katekaru	Howard D. Walker
Lee Charles Coombs	David L. Keeling	James D. Westover
Charles E. Dills	Martin A. Kellerman	Hewitt G. Wight
Norman L. Eatough	John F. Marlier	David G. Williamson
Leland S. Endres	John C. Maxwell	Max T. Wills
Thomas G. Frey	Neil J. Moir	Marshall S. Wright

The Chemistry Department, accredited by the American Chemical Society, has two roles in the University. It provides professional training to chemistry and biochemistry majors who plan careers in the natural sciences and allied fields, and it provides instruction in the fundamentals of chemistry to majors in fields related to chemistry, such as biology, engineering, soil science, dietetics, animal science, agriculture, and others.

The Chemistry Department emphasizes professional training in programs leading to the Bachelor of Science degree in Chemistry or Biochemistry, and the Master of Science degree in Chemistry. All undergraduate chemistry majors follow a core curriculum in general, organic, inorganic, analytical, and physical chemistry, and biochemistry. Advanced undergraduates choose electives from a large variety of advanced courses, special topics courses, and master's level courses; recent offerings have included Environmental Chemistry, Geochemistry, Nuclear Chemistry, Polymer Chemistry, Agricultural Chemicals, Chemistry of Ceramic Glazes, Industrial Catalysis, Food Analysis, Drugs and Poisons, Nutritional Biochemistry, and many others. A pillar of the undergraduate program is the Senior Project, an intensive research experience of individual student design; while Senior Projects are often in pure chemistry or biochemistry, many apply an interdisciplinary approach and involve professors from Physics, Biological Sciences, Art, Soil Science, Civil and Environmental Engineering, Child Development and Home Economics, and other departments. For students seeking industrial chemical experience before graduation, the Chemistry Department offers an increasingly active cooperative education program.

Career opportunities for chemists are constantly increasing, not only in traditional areas like industrial research and production, product quality control, environmental analysis, pharmacy, clinical chemistry, and secondary education, but also in nontraditional fields like patent law, science journalism, market research, safety engineering, and library science. A major in chemistry prepares the student for these careers or for specialized study after the bachelor's degree.

### CURRICULUM IN CHEMISTRY

Freshman	F	W	S
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
CHEM 156 General Chemistry Laboratory .....			1
ENGL 114 English Composition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 131, MATH 132, MATH 133 Technical Calculus or			
MATH 141, MATH 142, MATH 143 Analytic Geometry			
and Calculus (B.2.) .....	4	4	4
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2-4	
CSC 110 Computers and Computing (F.1.) .....			3
BIO 101/BOT 121/ZOO 131 elective (B.1.b.) .....		3-4	
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
	<u>15</u>	<u>13-16</u>	<u>15</u>

	F	W	S
<b>Sophomore</b>			
CHEM 331 Quantitative Analysis .....	5		
CHEM 316, CHEM 317, CHEM 318 Organic Chemistry .....	4	5	5
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
MATH 241, MATH 242 or STAT or CSC courses .....		4	4
CHEM 253 Chemical Literature .....		1	
HIST 204 Growth of American Democracy (D.1.) .....	3		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
	16	17	17
<b>Junior</b>			
<sup>1</sup> Approved Chemistry electives .....	3	4	
CHEM 305, CHEM 306, CHEM 307 Physical Chemistry .....	3	3	4
CHEM 355, CHEM 356 Physical Chemistry Laboratory .....	1	1	
<sup>2</sup> Physics elective (200-level and above) .....	3		
POLS 210 American and California Government (D.1.) .....			3
<sup>3</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>3</sup> Economics elective (D.3.) .....		3	
	16	17	16
<b>Senior</b>			
CHEM 439 Instrumental Analysis .....	5		
CHEM 461 Senior Project .....		2	
CHEM 481 Inorganic Chemistry .....		3	
CHEM 459 Undergraduate Seminar .....	2		
<sup>1</sup> Approved Chemistry electives .....	4	4	4
HIST 315 Modern World History (D.2.) .....		3	
<sup>3</sup> Technology elective (F.2.) .....			3
<sup>3</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
Electives .....	3	1-4	4
	14	13-16	14

<sup>1</sup> To be chosen from the following, to include at least three courses from list "b."

a. CHEM 252, 332, 335, 336, 341, 342, 344, 371, 372, 373, 374, 377, 378, 385, 400, 470, 471, COOP 360E.

b. CHEM 405, 419, 444, 457, 458, 462, 482, 500-level courses.

<sup>2</sup> May not be PHYS 215.

<sup>3</sup> Must be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

## CURRICULUM IN BIOCHEMISTRY

Freshman	F	W	S
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 131, MATH 132 Technical Calculus or			
MATH 141, MATH 142 Analytic Geometry and Calculus (B.2.)	4	4	
PHYS 121, PHYS 122 College Physics or			
PHYS 131, 132 General Physics (B.1.a.) .....		4	4
BOT 121 General Botany or			
ZOO 131 General Zoology or			
BACT 221 General Bacteriology (B.1.b.) .....		4	
<sup>1</sup> CSC 110 Computers and Computing (F.1.) .....			3
Electives .....	3		1-2
	15	16	15-16
Sophomore			
CHEM 331 Quantitative Analysis .....			5
CHEM 316, CHEM 317, CHEM 318 Organic Chemistry .....	4	5	5
PHYS 123 College Physics or			
PHYS 133 General Physics .....	4		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
POLS 210 American and California Government (D.1.) .....			3
HIST 204 Growth of American Democracy (D.1.) .....	3		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
<sup>2</sup> Life sciences elective (300-level recommended) (B.1.b.) .....		3-4	
CHEM 253 Chemical Literature .....		1	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
Elective .....	2		
	16	16-17	16
Junior			
CHEM 371, CHEM 372, CHEM 373 General Biochemistry .....	4	3	3
CHEM 374 Biochemistry Laboratory .....			2
<sup>3</sup> CHEM 301, CHEM 302 Biophysical Chemistry .....	3	4	
HIST 315 Modern World History (D.2.) .....	3		
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2-4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>2</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....		4-5	
<sup>2</sup> Critical Reading elective (C.3.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
Life sciences elective (300-level recommended) (B.1.b.) .....			3
	16	14-15	13-15

	F	W	S
Senior			
<sup>4</sup> Chemistry electives .....	3	3	3
CHEM 461 Senior Project .....		2	
CHEM 459 Undergraduate Seminar .....	2		
<sup>2</sup> Technology elective (F.2.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	4		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3-4	
Electives .....	7	4-5	11-12
	16	15-17	14-15



## CURRICULUM FOR MASTER OF SCIENCE DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

	Units
Required:	
500-level CHEM courses (CHEM 528 may not be counted in these 18 units. ....	18
CHEM 590 Graduate Seminar .....	3
CHEM 599 Thesis, or additional courses if nonthesis option is chosen .....	6
Additional courses at 400 or 500 level:	
12 units from the Chemistry Department and 6 units outside the Chemistry Department .....	18
	45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Chemistry and other subjects.

<sup>1</sup> CSC 101 will substitute.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> CHEM 305, CHEM 306, CHEM 355 will substitute.

<sup>4</sup> CHEM 156, CHEM 252, 300-, 400-, and 500-level courses (except CHEM 328, COOP 360E).



## COMPUTER SCIENCE AND STATISTICS DEPARTMENT

Department Head (Interim), Neil W. Webre

Jay S. Bayne	Roy B. Hollstien	John M. Rogers
James L. Beug	John Y. S. Hsu	Robert K. Smidt
Raymond E. Boche	Elmo A. Keller	Kent D. Smith
James C. Daly	Sham S. Luthra	Linda C. Stanberry
Charles H. Dana	Y. Leon Maksoudian	Daniel F. Stubbs
Jay L. Devore	Zane C. Motteler	Neil W. Webre
Robert H. Dourson	Roxy L. Peck	Patrick O. Wheatley
Joseph E. Grimes	Cornel K. Pokorny	Sing-Chou Wu
John E. Groves		

The department offers four-year programs which lead to the Bachelor of Science degree in Computer Science and to the Bachelor of Science degree in Statistics. The department also offers the Master of Science degree in Computer Science. Courses in computer technology and probability and statistics, designed to fulfill the needs of the university as a whole, are also provided. Graduate-level courses are offered in computer science and statistical fields. Computer science courses offered by the department comprise those dealing with programming languages, computer organization, system software, and applications of computers. Statistics courses include probability theory, applications of statistical procedures, and the mathematical models on which the statistical methods are based.

The degree programs in computer science are designed to give professional training so that the student can make a significant contribution to the employer on graduation. Applications of the digital computer to a wide variety of situations are emphasized, and a thorough knowledge of computer systems is gained by developing facility in a variety of languages through which one communicates with computers, by study of programs which translate and compile such languages, and by "hands-on" involvement with programs which control the internal operation of computer systems. Such a broad and thorough undergraduate training is likewise good preparation for graduate study. Graduates in computer science are eagerly sought for positions as program analysts, systems engineers, applications programmers, and sales representatives. Access to modern computing equipment is afforded through the university's computer center, which conducts both educational and administrative applications and through minicomputer, microprocessor and graphics laboratories. In addition, students have access to both batch and interactive facilities maintained by the State University system.

The degree program in statistics has an unusual emphasis on applications and on use of the computer in statistical analysis of data. Students in statistics are expected to specialize in a field of application of their own choosing, and a significant number of elective courses are selected by the student to accomplish this. Graduates are prepared for employment with various research organizations, insurance companies, large industrial companies, and government agencies, and are also qualified to do graduate work in various technical disciplines.

A student chapter of the Association for Computing Machinery is sponsored by the department. This active student organization supplements the department's activities in supplying vital contact with expert professional personnel from business and industry.

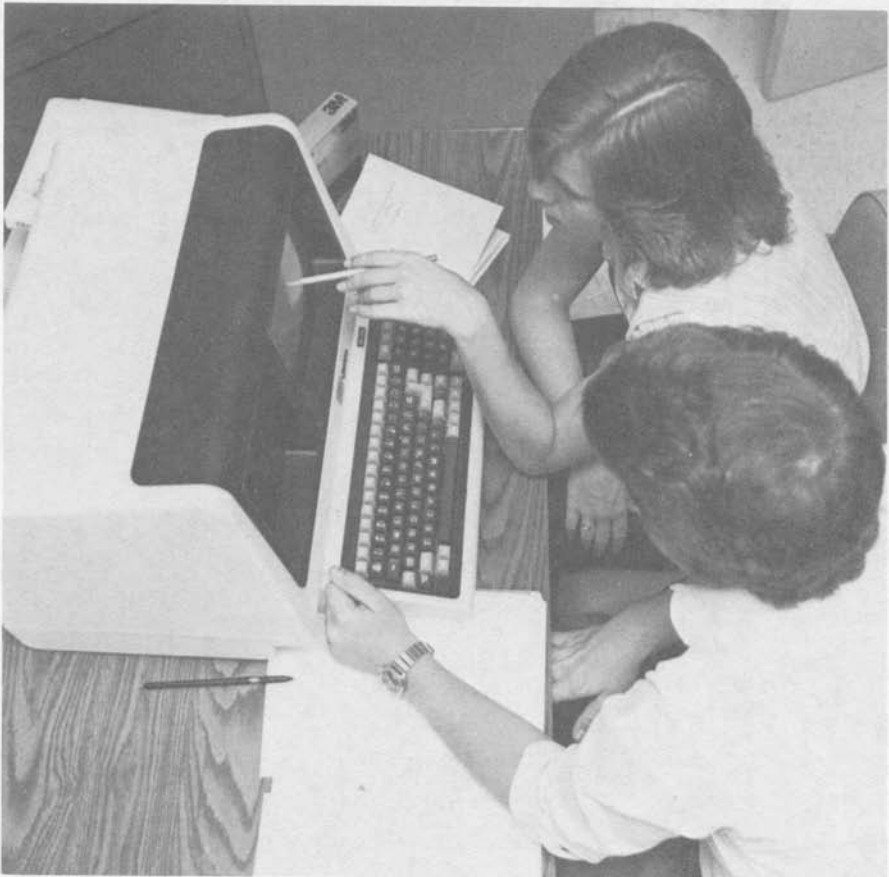
CURRICULUM IN COMPUTER SCIENCE

Freshman	F	W	S
CSC 118 Fundamentals of Computer Science (F.1.) .....	4		
CSC 201 Advanced Fortran Programming .....			3
CSC 221 Computer Principles and Programming .....		3	
CSC 222 Digital Computer Symbolic Programming .....			3
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....	3		
CHEM 124 General Chemistry .....			4
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....			3
EL 219 Logic and Switching Circuits .....	3		
ENGL 114 Writing: Exposition (A.1.) .....		4	
<sup>1</sup> Technology elective (F.2.) .....		2	
<sup>2</sup> Electives .....	3	3	
	17	16	17
Sophomore			
CSC 219 Linear Programming .....	3		
HIST 204 Growth of American Democracy (D.1.) .....			3
MATH 204 Mathematics of Matrices or MATH 241 Analytic Geometry and Calculus .....	3-4		
CSC 245 Discrete Structures .....	3		
CSC 345 Data Structures .....		3	
MATH 242 Differential Equations .....		0-4	
CSC 340 Software Tools .....			3
CSC 331 Numerical Linear Analysis or CSC 332 Numerical Analysis I .....			3
PHYS 131, PHYS 133 General Physics (B.1.a.) .....	4	4	
CSC 304 Introduction to Digital Computer Architecture .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2	
<sup>2</sup> Electives .....	0-1	4-8	
	17	17	18
Junior			
STAT 321, STAT 322 Statistical Analysis (B.2.) .....		3	3
CSC 346 File Structures .....		3	
CSC 351 Programming Languages I:Design .....			3
CSC 353 Computer Systems Programming .....	3		
ECON1 Principles of Economics (D.3.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Life sciences elective (B.1.b.) .....		3	
<sup>2</sup> Electives .....	7	2	3
	16	17	16

	F	W	S
<b>Senior</b>			
CSC 450 Programming Languages II: Description and Analysis .....	3		
CSC 451 Programming Languages III: Compiler Implementation ....			3
CSC 404 Telecommunications and Distributed Systems .....		3	
CSC 453 Introduction to Operating Systems .....		3	
CSC 440 Computer Based System Development .....	3		
CSC 461, CSC 462 Senior Project .....	3	3	
CSC 446 Database Systems .....			3
CSC 463 Undergraduate Seminar .....	2		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....	3		3
<sup>2</sup> Electives .....	4	2	3
	15	17	15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see Page 47 of this catalog.)

<sup>2</sup> At least 16 units must be selected with the approval of the student's adviser in one field in which computer science is applied.



CURRICULUM IN STATISTICS

Freshman	F	W	S
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.)	4	4	4
CSC 101 Fortran Programming or CSC 118 Fundamentals of Computer Science	2-4		
ENGL 114 Writing: Exposition (A.1.)	4		
ENGL 218 Writing: Argumentation and Reports (A.4.)			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.)		3	
PHYS 131 General Physics (B.1.a.)		4	
BIO 101 General Biology (B.1.b.)			3
PSY 201/PSY 202 General Psychology (E.1.)			3
<sup>1</sup> Electives	4-6	5	3
	16	16	17
Sophomore			
MATH 241 Analytic Geometry and Calculus	4		
MATH 204 Mathematics of Matrices		3	
MATH 242 Differential Equations		4	
STAT 321, STAT 322 Statistical Analysis		3	3
MATH 248 Methods of Proof in Mathematics			3
CSC 201 Advanced Fortran Programming or CSC 118 Fundamentals of Computer Science	3-4		
ECON 211 Principles of Economics (D.3.)	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.)			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.)			3
BIO 303 Genetics (B.1.b.)			3
ANT 201/GEOG 150/SOC 105 elective (D.4.)	3		
<sup>2</sup> ART/MU/TH elective (C.2.)		3	
<sup>1</sup> Electives	3	3	1
	16-17	16	16
Junior			
STAT 323 Analysis of Variance	3		
STAT 330 Statistical Use of Computers		3	
STAT 324 Applied Regression Analysis			3
STAT 421 Sampling Techniques			3
CSC 332 Numerical Analysis I			3
<sup>2</sup> Critical reading electives (C.1.)	3	3	
CSC 219 Linear Programming (F.1.)		3	
<sup>3</sup> Approved MATH electives (300-400 level)	3	3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.)	2		
<sup>2</sup> Literature, philosophy, arts elective (C.3.)			3
POLS 210 American and California Government (D.1.)	3		
HIST 204 Growth of American Democracy (D.1.)			3
<sup>1</sup> Electives	3	3-4	2
	17	15-16	17

	F	W	S
<b>Senior</b>			
STAT 425 Probability Theory and Applications I .....	3		
STAT 426 Probability Theory and Applications II .....		3	
STAT 427 Mathematical Statistics .....			3
STAT 415 Nonparametric Methods in Statistics .....	3		
STAT 423 Linear Models .....		3	
STAT 418 Topics in Multivariate Statistics .....			3
STAT 461, STAT 462 Senior Project .....	2	2	
STAT 463 Undergraduate Seminar .....			2
<sup>2</sup> Technology elective (F.2.) .....		2	
CSC 350 Discrete Dynamic Systems .....	3		
HIST 315 Modern World History (D.2.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>1</sup> Electives .....	3	4	6
	17	17	17

## CURRICULUM FOR MASTER OF SCIENCE DEGREE

(For University requirements see the *Graduate Studies Bulletin*)

The student must take at least 45 units of work beyond the undergraduate degree chosen to include:

	Units
I. A core sequence of required graduate courses: .....	25
CSC 541, CSC 542 Advanced Data Base Topics .....	8
CSC 551, CSC 552 Computer Systems and Software.....	8
CSC 559, CSC 560 Practicum in Computer Science (I) (II) .....	6
CSC 590 Seminar in Computer Science .....	3
II. A pool of suitable elective courses to complete the required 45 units. ....	20
Suggested courses include:	
CSC 404 Telecommunications and Distributed Systems.....	3
CSC 409 Microcomputer Systems.....	4
CSC 420 Artificial Intelligence Survey .....	3
CSC 440 Computer Based System Development .....	3
CSC 454 Kernels and Real-Time Programming .....	4
CSC 455 Computer Graphics.....	4
CSC 519, CSC 520 Computer Simulation I, II .....	8
CSC 531 Numerical Solution of Algebraic Systems and	
CSC 532 Numerical Solution of Differential Equations .....	8
CSC 570 Selected Topics in Computer Science .....	1-3
CSC 599 Thesis/Project .....	4-6
EL 520 Digital Systems Design and	
EL 521 Computer Systems and	
EL 522 Microprocessor-Based Digital System Design.....	10
III. Each student is required to successfully complete a final oral and/or written examination administered by the Graduate Studies Committee. If the nonthesis option is selected, then the examination will be on the required and elective courses chosen by the student. If the thesis option is taken, then part of the examination is the thesis defense and the remainder is on the course work taken.	45

<sup>1</sup> At least 15 units must be selected with the approval of adviser in one field in which statistics is applied.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> Must be selected with approval of adviser.

## MATHEMATICS DEPARTMENT

Department Head (Interim), Paul F. Murphy

Sabah Al-hadad	Donald G. Hartig	Jean M. McDill
Alfred M. Bachman	Charles T. Haskell	Kent E. Morrison
Bernard W. Banks	Alan W. Holz	James R. Mueller
Estelle L. Basor	J. Myron Hood	Thomas D. O'Neil
Michael R. Colvin	Kempton L. Huehn	Don Rawlings
H. Arthur DeKleine	Rex L. Hutton	Howard Steinberg
James E. Delany	Boyd Walker Johnson	H. Bernard Strickmeier
Gary M. Epstein	Goro C. Kato	Raymond D. Terry
Gerald P. Farrell	Euel W. Kennedy	Neal R. Townsend
Jack E. Girolo	Martin T. Lang	John Van Eps
D. Edward Glassco	George M. Lewis	Ralph M. Warten
Stuart Goldenberg	John J. Lowry	Stephen T. Weinstein
Harvey C. Greenwald	George W. Luna	Robert S. Wolf
Thomas E. Hale	George R. Mach	Ahmed I. Zayed
Adelaide T. Harmon-Elliott		

The Mathematics Department offers a complete program of university work leading to a Bachelor of Science degree in Mathematics with options in Applied Mathematics, Finite Mathematics, and Mathematics Teaching. The department also offers Mathematics courses needed in all other curricula for developing vocational and professional proficiency and for general education. The occupational flavor generated by these close interdepartmental relations increases both the usefulness of and the demand for the graduates who complete one of the degrees in mathematics.

High school students planning a mathematics major should have at least three, and preferably four, years of high school mathematics, and two years of science.

A program of study which leads to a Master of Science degree in Mathematics with specializations in Mathematics Teaching and in Applied Mathematics is offered. A graduate in the mathematics teaching specialization of this program will be qualified for community college teaching positions or, with the proper credential, for teaching positions in secondary schools. A graduate in the applied mathematics specialization will be qualified for advanced positions in industry, business, civil service, college teaching, or other scientific endeavors.

### CURRICULAR OPTIONS

#### Applied Mathematics

This option is designed for students desiring a broad exposure to those fields of mathematics which have been, and continue to be, most useful to the development of physical sciences and engineering. This option will furnish the mathematics needed by a student who seeks to enter employment in industry or government as a support mathematician for production, research, and development. In addition, this option will provide adequate mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

#### Finite Mathematics

This option is designed for students in this rapidly growing branch of mathematics that has many applications in business and management sciences, resources allocation, and traffic flow. A student in computer science, industrial engineering, business, and in related fields will find many topics of interest in this option. Emphasis will be on mathematical model building and applications.

#### Mathematics Teaching

The Mathematics Teaching Option is designed primarily to prepare the student for a teaching career in junior and senior high schools. With additional courses as prescribed by the Education Department, the student completing this option can obtain a California single subject teaching credential in mathematics. This option also provides the student with a desirable undergraduate foundation for the master of science degree in the mathematics teaching specialization, a degree appropriate for teaching service in community colleges and also appropriate for secondary school mathematics teachers.

## CURRICULUM IN MATHEMATICS

Freshman	F	W	S
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
MATH 170 Theory of Equations .....			2
CSC 101 Fortran Programming .....	2		
<sup>1</sup> PHYS 131, PHYS 132 Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
Electives and courses to complete major .....	6	6	6
	16	17	16
Sophomore			
MATH 241 Analytic Geometry and Calculus .....	4		
<sup>2</sup> CSC 221 Computer Principles and Programming (F.1.) .....			3
MATH 242 Differential Equations .....		4	
MATH 248 Methods of Proof in Mathematics .....	3		
MATH 312 Linear Algebra .....		4	
STAT 321 Statistical Analysis .....			3
<sup>1</sup> PHYS 133 General Physics (B.1.a.) .....	4		
HIST 204 Growth of American Democracy (D.1.) .....		3	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
Electives and courses to complete major .....	3	3	8
	17	17	18
Junior			
MATH 381 Modern Algebra .....		4	
STAT 322 Statistical Analysis .....	3		
HIST 315 Modern World History (D.2.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>3</sup> Life sciences elective (B.1.b.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>3</sup> Critical reading electives (C.1.) .....		3	3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....	3		
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....		3	
<sup>3</sup> Economics elective (D.3.) .....			3
Electives and courses to complete major .....	4	4	5
	16	17	16

# 256 Mathematics

	F	W	S
<b>Senior</b>			
MATH 412 Advanced Calculus .....	4		
MATH 459 Undergraduate Seminar .....	2		
MATH 461, MATH 462 Senior Project .....		3	2
<sup>3</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>3</sup> Literature, philosophy, arts elective (3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Technology elective (F.2.) .....		3	
Electives and courses to complete major .....	7	7	11
	16	16	16

## **APPLIED MATHEMATICS OPTION** (Add Courses Below to Mathematics Curriculum)

MATH 304 Vector Analysis .....	(4)	CSC 332, CSC 333 Numerical Analysis I, II .....	(6)
MATH 313 Linear Algebra .....	(4)	MATH 336 Combinatorial Mathemat- ics .....	(3)
MATH 318 Advanced Engineering Mathematics .....	(4)	MATH 408 Functions of a Complex Variable .....	(4)
MATH 319 Partial Differential Equa- tions .....	(4)	MATH 413 Advanced Calculus .....	(3)

## **FINITE MATHEMATICS OPTION** (Add Courses Below to Mathematics Curriculum)

MATH 313 Linear Algebra .....	(4)	MATH 437 Game Theory .....	(3)
MATH 318 Advanced Engineering Mathematics .....	(4)	CSC 219 Linear Programming .....	(3)
MATH 335 Graph Theory .....	(3)	CSC 350 Discrete Dynamic Systems .....	(3)
MATH 336 Combinatorial Mathematics .....	(3)	CSC 360 Continuous Dynamic Systems .....	(3)
MATH 431, MATH 432 Mathemati- cal Optimization I, II .....	(6)	CSC 419 Mathematical Programming .....	(3)

## **MATHEMATICS TEACHING OPTION** (Add Courses Below to Mathematics Curriculum)

MATH 105 Hand-held Calculators ....	(1)	MATH 424 Organizing and Teaching Mathematics .....	(3)
MATH 341 Theory of Numbers .....	(4)	MATH 442 College Geometry .....	(3)
MATH 382 Modern Algebra .....	(4)	MATH 443 Non-Euclidian Geometry .....	(3)
MATH 403 Issues in Secondary School Mathematics Education .....	(3)	MATH 444 Projective Geometry .....	(3)
MATH 419 Introduction to History of Mathematics .....	(3)	CSC 207 Advanced BASIC Program- ming .....	(3)

<sup>1</sup> Teaching option majors may substitute PHYS 121, PHYS 122, PHYS 123

<sup>2</sup> Teaching option majors may substitute CSC 414.

<sup>3</sup> To be selected in accordance with General Education-Breadth requirements. (Please see page 47 of this catalog.)



## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

With Specializations in Mathematics Teaching and in Applied Mathematics

(For University requirements see the *Graduate Study Bulletin*)

	<i>Units</i>
I. Required MATH 506, MATH 508, MATH 515 .....	12
II. <sup>1</sup> 12 units of 500-level courses selected according to specialization .....	12
III. <sup>1</sup> Select 12 units from 400- and 500-level courses having the prefixes: MATH, CSC, STAT with approval of the advising committee .....	12
IV. <sup>2</sup> Select 9 additional units with approval of adviser .....	9
V. Satisfactorily complete a terminal written and oral examination; or complete MATH 596, Graduate Thesis, for 6 units of credit toward the 12 units required in MATH, CSC, or STAT .....	—
	45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Computer Science, Mathematics, Statistics, and other subjects.

<sup>1</sup> For specialization in Teaching: MATH 580, 519, and 4 additional units selected from MATH 505, 507, 510, 580. For specialization in Applied Mathematics MATH 580, 512, and 4 additional units selected from: MATH 513, 516, 518, 580.

<sup>2</sup> For specialization in Applied Mathematics, these units to be selected in one area other than mathematics, statistics, and computer science (physics, engineering, economics, chemistry, etc.). Exceptions may be made for candidates with an approved baccalaureate or higher degree in a field other than mathematics, computer science or statistics.



## MILITARY SCIENCE DEPARTMENT

Department Head, Lt. Colonel Richard L. Jones

Major Michal R. Robinson

Major John P. Walsh, Jr.

### PURPOSE

The Military Science Department conducts a program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and/or civilian communities. Both men and women students may enroll for full academic elective credit without incurring any military service obligation. Courses complement all major areas of study by broadening the student's basic education. The curriculum includes both military leadership and management courses, and courses which provide an awareness of the heritage of the U.S. Military: the Armed Forces role in national defense strategy; professional military subjects and military ethics. Students desiring to attain a commission as a Second Lieutenant in the U.S. Army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officer Training Corps) Advanced Course. To be eligible for participation in ROTC, a student must be full time (12 units) and enrolled at this University, have sufficient time remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified. ROTC scholarships are available which provide full tuition, books, supplies, and an allowance of \$100 per month for the duration of the scholarship. Nonscholarship ROTC cadets also receive an allowance of \$100 per month while enrolled in the advanced course. Students who are members of the National Guard or Army Reserves may participate in the ROTC Advanced Course simultaneously. Students involved in both can receive up to \$10,000 in four years of college.

### EQUIPMENT AND UNIFORMS

All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government. Students entering into active commissioned service after graduation are granted a special \$300 uniform allowance.

### FOUR-YEAR PROGRAM

The four-year elective ROTC program is a progressive course of instruction divided into a two-year basic course and a two-year advanced course.

Students with previous military service, or with Junior ROTC credit or ROTC credit from another institution, may be granted advanced standing in the program. Students who will complete degree requirements in three academic years may enroll in first-year and second-year ROTC courses concurrently and complete the four-year program in three years.

Students who elect to enter the Advanced Course of ROTC instruction are paid \$100 per month while enrolled. The ultimate obligation connected with the receipt of this subsistence allowance is the willingness by the student to accept a reserve commission of Second Lieutenant if it is offered upon graduation and to serve a period of three years on active duty or a period of six years reserve duty as a commissioned officer.

Four-year program students are required to attend summer training camp for a six-week period following completion of their third year. The government furnishes all uniforms, equipment, room, board, and medical care for students at camp. Additionally, each student is paid at the rate prescribed by law for cadets at the U.S. Military Academy and is provided a transportation allowance from and to home. No university credit is accrued for the advanced summer camp.

## TWO-YEAR PROGRAM

The opportunity offered by ROTC training is available in a special program to transfer students and to currently enrolled college students who were unable to participate in the four-year ROTC program.

To qualify for the two-year program, the student must complete a special ROTC summer Basic Camp of six weeks duration. Students normally attend Basic Camp between their second and third academic years. Transfer students must complete the camp during the summer immediately prior to their matriculation at this University. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than March 1 of the year they plan to register at the University even though this date may precede the date of their final acceptance by the University.

The government will provide a transportation allowance to and from Basic Camp and pay at the rate of one-half of a Second Lieutenant's basic pay. All equipment, uniforms, room, board and medical care are furnished free while at camp. Basic Camp is in addition to the advanced camp requirement. This University grants up to 7 units elective credit for Basic Camp. No military obligation is incurred as a result of attendance.

Upon successful completion of the Basic Camp, the student can voluntarily be admitted into the advanced ROTC course during fall registration at the University. The student is entitled then to the advanced course subsistence allowance and all other privileges of advanced course standing as enumerated above under the four-year program.

Students who are unable to attend the Basic Camp may still qualify for the advanced course by participating in a series of courses offered during the summer quarter. This program is a combination of academic courses and practical application designed to bring a participating student to the same level as those who attend either the first two years of the four-year program or the Basic Camp. Students satisfactorily completing this program earn 6 units of academic credit and may be admitted directly into the advanced ROTC course during the fall quarter.

## MODULAR PROGRAM

Basic course students are offered an alternative to the courses of instruction for which academic elective credit is given. The modular program may be substituted for the four-year program basic course, and is based on practical application through activity participation rather than the academic curriculum. A variety of skill and adventure modules, for which no elective credit units accrue, are offered and may be pursued solely or in combination with the academic curriculum to qualify for entry directly into the advanced ROTC course. Cadets so qualifying for the advanced course receive the subsistence allowance and all other privileges of advanced course standing as enumerated above under the four-year program. Students desiring to participate in the modular program do so by contacting the enrollment officer of the Military Science Department.

## SIMULTANEOUS MEMBERSHIP PROGRAM

Students can serve simultaneously in the National Guard or Army Reserves and ROTC and receive pay from both sources. Those who complete the ROTC Advanced Course prior to graduation are eligible for the Early Commissioning Program. Since students can earn up to \$10,000 in four years of college this program provides both financial and experience benefits.

## EARLY COMMISSIONING PROGRAM

Students who complete ROTC requirements prior to graduation will be commissioned early and may enter the National Guard or Army Reserves as Second Lieutenants. These students would be expected to complete their undergraduate work and could remain in the Guard or Reserves or request entrance into active duty upon graduation.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Military Science and other subjects.

# PHYSICS DEPARTMENT

Department Head (Interim), Keith S. Stowe

Lawrence H. Balthaser	Teymoor Gedayloo	David M. Roach
Joseph C. Boone	David W. Hafemeister	Arthur Z. Rosen
Ronald F. Brown	Kenneth A. Hoffman	Richard A. Saenz
Anthony J. Buffa	James S. Kalathil	Thomas G. Schumann
Arthur S. Cary	John Mottmann	Gordon A. Silver
David H. Chipping	Kenneth S. Ozawa	Willem L. van Wyngaarden
Christopher DeLatour	Ralph A. Peters	Leonard W. Wall
Robert H. Dickerson	John E. Poling	Walter D. Wilson
Theodore C. Foster		

The Physics Department serves all schools of the University by offering courses which provide the scientific foundations for work taken by students in their major fields. The department also contributes to the general education of all students by increasing their understanding of the process of scientific discovery, of the nature of the physical universe, and of the potential impact of science on society. The department offers curricula in physics and in physical sciences leading to the Bachelor of Science degree.

The department's goal in training physics majors is to prepare them for entry into positions as physicists, to prepare them for further training as physics teachers, especially at the community college or more advanced levels, or to give them a strong foundation in science that will enable them to enter other related professions. The program prepares students for possible further formal education in graduate school. Graduates are engaged in many fields and industries, including computers, electronics, aerospace, energy production and utilization, and the development of material resources and products. To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program, with facilities which include specialized laboratories in electrical measurements, optics, solid state physics, nuclear physics, and reactor physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

It is suggested that the high school student planning to major in physics include in his or her high school program as much as possible of the following: six semesters of college preparatory mathematics, two of physics and two of chemistry.

The Bachelor of Science in Physical Science is a degree major designed primarily to provide undergraduate preparation for the student who intends to be a secondary school teacher of one or more of the physical sciences. It may also serve students who plan to enter another field in which a physical science background would be useful, but students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. Students planning to qualify for a teaching credential in physical science should plan their electives to include the education courses indicated. The Physical Science degree program is administered jointly by the Chemistry and Physics Departments.

## CURRICULUM IN PHYSICS

Freshman	F	W	S
<sup>1</sup> Life sciences elective (B.1.b.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education or			
PSY 304 Comparative and Physiological Psychology (E.2.) .....		2-3	
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus	4	4	4

Physics 261

	F	W	S
CHEM 127, CHEM 128 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry (B.1.a.) .....			4
PHYS 131, PHYS 132 General Physics .....		4	4
PHYS 100 Introduction to Physics .....	1		
	16	17-18	15

Sophomore

ECON 201/ECON 211/ECON 222 (D.3.) .....			3-4
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
<sup>2</sup> Computer literacy elective (F.1.) .....	2		
MATH 318 Advanced Engineering .....			4
PHYS 133, PHYS 134 General Physics .....	4	3	
PHYS 211 Modern Physics .....		4	
PHYS 213 Introduction to Nuclear Physics .....			3
PHYS 243 Introductory Nuclear Physics Laboratory .....			1
PHYS 206, PHYS 207 Instrumentation in Experimental Physics .....		2	2
PHYS 256, PHYS 257 Electrical Measurements Laboratory .....		1	1
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> Philosophy elective (C.3.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
	16	17	17-18

Junior

<sup>1</sup> Critical reading electives (C.1.) .....	3		3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
MATH 319 Partial Differential Equations .....		4	
MATH 304 Vector Analysis (B.2.) .....	4		
PHYS 301 Statistical Physics and Heat .....	3		
PHYS 302, PHYS 303 Analytic Mechanics .....	3	3	
PHYS 406, PHYS 456 Solid State Physics and Laboratory .....		3	1
PHYS 405 Quantum Mechanics .....	3		
PHYS 341, PHYS 342 Quantum Physics Laboratory .....	1	2	
PHYS 323 Physical Optics .....			4
PHYS 363 Undergraduate Seminar .....			2
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.) .....		3	
	17	15	17

Senior

POLS 210 American and California Government (D.1.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.) .....	3		
PHYS 408, PHYS 409 Electromagnetic Fields and Waves .....	4	3	
PHYS 461, PHYS 462 Senior Project .....	2	2	
Approved PHYS electives .....	3	3	3
<sup>1</sup> Technology elective (F.2.) .....			3
Electives .....		4	4-6
	15	15	13-15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>2</sup> CSC 101, CSC 118, CSC 120 or any course requiring one of these courses as a prerequisite.

## CURRICULUM IN PHYSICAL SCIENCE

Freshman	F	W	S
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) ..	4	4	4
<sup>1</sup> PHYS 131, PHYS 132 General Physics or PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus or MATH 131, MATH 132, MATH 133 Technical Calculus (B.2.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
	15	15	15
Sophomore			
<sup>1</sup> Chemistry electives (CHEM 326 or CHEM 316 and CHEM 328 or CHEM 371) .....	4		4
<sup>1</sup> Physics electives (PHYS 133 or PHYS 123 and PHYS 211 or PHYS 210) .....	4	4	
<sup>3</sup> Physics elective .....		3	
<sup>4</sup> MATH, CSC, or STAT electives .....		4	4
CSC 110 Computers and Computing or CSC 410 Computer Fundamentals for Educators (F.1.) .....	3		
GEOL 201 Physical Geology .....			3
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....	3		
HIST 204 Growth of American Democracy (D.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>5</sup> PE 250 Health Education (E.2.) .....		2	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
	17	16	17
Junior			
CHEM 301 Biophysical Chemistry or CHEM 305 Physical Chemistry .....	3		
ASTR 301 The Solar System or ASTR 302 Stars and Galaxies .....	3		
<sup>2</sup> Life science elective (B.1.b.) .....	3		
<sup>3</sup> Chemistry elective .....		4	
<sup>3</sup> Astronomy and/or earth science elective .....			4
<sup>3</sup> Physical science 300-400 level electives .....		3	3
<sup>2</sup> ANT/BUS/ECON/GEOP/POLS/SOC elective (D.4.) .....		3	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ANT 201/GEOP 150/SOC 105 elective (D.4.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
Electives toward credential requirements:			
ED 305 Teaching and Learning Processes .....		3	
ED 404 Field Experience in Secondary School Reading .....		3	
ED 409 Teaching in the Secondary School .....			3
ED 302 Multicultural Education in the Secondary School .....			3
	16	16	16

F W S

## Senior

CHEM 461, PHYS 461, or PSC 461 Senior Project .....	2		
<sup>3</sup> Approved Physical Sciences 300-400 level elective. (Prospective teachers take PSC 424 Organizing and Teaching of Physical Science) .....	3		
<sup>3</sup> Physics 300-400 level elective .....			3
<sup>2</sup> Critical reading electives (C.1.) .....		3	3
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....			6
<sup>2</sup> Technology elective (F.2.) .....	3		
Electives toward credential requirements:			
ED 405 Diagnosis, Prescription, and Evaluation .....	2		
ED 410, ED 420 Student Teaching .....	6	12	
ED 403 Reading Methods in the Secondary School .....			3
	16	15	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physics and Physical Science and other subjects.

<sup>1</sup> A choice of the PHYS 121, PHYS 122, PHYS 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 47 of this catalog.)

<sup>3</sup> Chosen with approval of adviser.

<sup>4</sup> Must be at least 200 level.

<sup>5</sup> BIO 220, HE 210 or PSY 304 are acceptable alternatives.





## Intercollegiate Athletics

## INTERCOLLEGIATE ATHLETICS DEPARTMENT

Hugh Bream  
John Crivello  
Craig Cummings  
Vic Ecklund  
Wolfgang Gartner  
David W. Grosz  
Berdy V. Harr

Richard Heaton, Director

Lance Harter  
Tom Henderson  
Vaughan Hitchcock  
Marilyn McNeil  
Duane McRoy  
Tony Oddo  
James D. Sanderson

Chris Smeland  
Ernest J. Wheeler, Jr.  
Darla Wilson  
Michael Wilton  
Orion Yeast  
Steve Yoneda  
Lorene Yoshihara

Although administered as a separate department, Intercollegiate Athletics and Physical Education are closely related with many of the personnel holding both coaching and teaching assignments and with joint utilization of most facilities. Students participating in intercollegiate athletics receive academic credit in courses offered through the Physical Education Department.

All the teams, with the exception of wrestling and women's volleyball, compete at the NCAA Division II level. Wrestling and women's volleyball compete at the Division I level. The football program is a member of the Western Football Conference. Wrestling and women's volleyball compete as independents. The balance of the women's and men's programs are in the California Collegiate Athletic Association (CCAA). Through the end of the 1983-84 year, Cal Poly has won 20 NCAA Division II team titles—number 1 in the nation.



## Courses of Instruction

## SCHOOLS, DEPARTMENTS AND COURSE PREFIXES

### SCHOOL OF AGRICULTURE AND

NATURAL RESOURCES.....	AG
Agricultural Education .....	AGED
Agricultural Engineering .....	AE
Agricultural Management .....	AM
Animal and Veterinary Science.....	ASCI, VS
Crop Science .....	CRSC, FRSC, VGSC
Dairy Science .....	DH, DM
Food Science .....	FDSC
Natural Resources Management .....	FOR, NRM
Ornamental Horticulture .....	OH
Poultry.....	PI
Soil Science.....	SS

### SCHOOL OF ARCHITECTURE AND

ENVIRONMENTAL DESIGN .....	EDES
Architectural Engineering .....	ARCE
Architecture .....	ARCH
City and Regional Planning .....	CRP
Construction Management .....	CM
Landscape Architecture .....	LA

### SCHOOL OF BUSINESS.....

Accounting .....	GSB
Accounting .....	ACTG
Business Administration .....	BUS, FIN, MKTG
Economics.....	ECON
Management.....	MGT

### SCHOOL OF COMMUNICATIVE ARTS

AND HUMANITIES .....	HUM
Art .....	ART
English.....	ENGL
Foreign Languages .....	FORL, FR, GER, SPAN
Graphic Communications .....	GRC
History .....	HIST
Journalism.....	JOUR
Music .....	MU
Philosophy .....	PHIL
Political Science.....	POLS
Social Sciences .....	ANT, GEOG, SOC, SOCS
Speech Communication .....	SPC, TH

### SCHOOL OF ENGINEERING AND TECHNOLOGY .....

ENGR	
Aeronautical and Mechanical Engineering.....	AERO, ME
Civil and Environmental Engineering .....	CE, ENVE
Electronic and Electrical Engineering.....	EE, EL
Engineering Technology .....	ET, ETAC, ETEL, ETME, ETMP, ETWT
Industrial Engineering.....	IE
Industrial Technology .....	IT
Metallurgical and Welding Engineering .....	MET

### SCHOOL OF HUMAN DEVELOPMENT AND

EDUCATION .....	LS
Child Development and Home Economics.....	CFD, DFA, HE
Education .....	ED, ETHS

Physical Education and Recreation	
Administration.....	PD, PE, PEM, PEW, REC
Psychology .....	PSY
<b>SCHOOL OF SCIENCE AND MATHEMATICS</b>	
Biological Sciences .....	BACT, BIO, BOT, CONS, ENT, ZOO
Chemistry .....	CHEM
Computer Science and Statistics .....	CSC, STAT
Mathematics .....	MATH
Military Science.....	MSC
Physics.....	ASTR, GEOL, PHYS, PSC
UNIVERSITY LIBRARY .....	LIB

## COURSE DESCRIPTIONS

Courses are listed alphabetically by prefix abbreviation. Prefixes and page numbers on which they begin are listed below.

Descriptions of experimental courses (designated by X following the course number) will be found in the quarterly Class Schedule, which is sold in El Corral Bookstore on campus.

Some courses will be shown as cross-listed in the title line. These courses cannot be repeated for credit under the separate prefixes.

### Course Numbering System

The numbering system used is a three-digit system. Courses are generally numbered according to the plan shown below.

010-099 Nondegree credit or short courses.

100-299 Courses taught primarily in the freshman and sophomore years.

300-399 Courses primarily for advanced undergraduate students, generally bearing no graduate degree credit.

400-499 Courses for advanced undergraduates and graduate students.

500-599 Graduate courses.

600-699 Courses for professional advancement within a special field and do not carry credit for degree requirements in any of the curricula.

### Prerequisites

Prerequisites indicate recommended preparation. Course prerequisites cited in this catalog are intended to inform the student of any previous work needed for the course. Eligibility of students who do not meet the stated prerequisites is determined by their academic advisers and the appropriate instructor.

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## ACTG—ACCOUNTING

### ACTG 211 Financial Accounting for Nonbusiness Majors (4)

Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to students in business administration. 4 lectures.

### ACTG 221, 222 Financial Accounting I and II (4) (4)

Introduction to financial accounting theory and practice. 4 lectures. Sequence courses.

### ACTG 301 Managerial Accounting (4)

Applications of accounting to management decision-making planning and control including cost behavior, budget preparation, and performance reporting. 4 lectures. Prerequisite: ACTG 222, MATH 221, STAT 252, and ECON 222, or consent of instructor.

### ACTG 304 Tax Accounting (4)

Federal and state income taxation of individuals. 4 lectures. Prerequisite: ACTG 211 or ACTG 221 and junior standing.

### ACTG 321, 322 Intermediate Accounting I and II (4) (4)

Rigorous coverage of financial accounting fundamentals. 321 emphasizes mastery of the accounting model, institutional and theoretical structures, and accounting for current items. 322 emphasizes accounting for long-term monetary items and corporate equities. 4 lectures. Prerequisite: ACTG 222 and junior standing. Completion of ACTG 321 with a grade of at least C- for ACTG 322.

### ACTG 323 Advanced Accounting I (4)

Specialized topics in financial accounting. Emphasizes partnerships, international accounting, and special corporate reporting issues. 4 lectures. Prerequisite: ACTG 322.

### ACTG 400 Special Problems for Advanced Undergraduates (1-4)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing or consent of instructor.

### ACTG 402 Advanced Cost Accounting (4)

Process and standard costs; overhead costs, budgeting. Use of cost accounting data in economic analyses and managerial control. 4 lectures. Prerequisite: ACTG 301.

**ACTG 404 Advanced Tax Accounting (4)**

Federal and state income taxation of corporations, partnerships, estates and trusts. Federal and state gift and death taxes. 4 lectures. Prerequisite: ACTG 304.

**ACTG 424 Advanced Accounting II (4)**

Business combinations, governmental entities, and nonbusiness organizations. 4 lectures. Prerequisite: ACTG 322. ACTG 323 is not prerequisite to ACTG 424.

**ACTG 431 Professional Accounting (4)**

Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his/her social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: ACTG 323 or consent of instructor.

**ACTG 446 Auditing (4)**

Professional auditing: theory, philosophy and problems. 4 lectures. Prerequisite: ACTG 323 or consent of instructor. MGT 321 is recommended.

**ACTG 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**ACTG 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ACTG 500 Individual Study (1-4)**

Advanced study planned and completed under direction of departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

## **AE—AGRICULTURAL ENGINEERING**

**AE 121 Agricultural Mechanics (2)**

Identification and use of tools and materials; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. 1 lecture, 1 laboratory.

**AE 122 Agricultural Mechanics (2)**

Design, construction and repair of production equipment for livestock, dairy, poultry, and farming equipment. 1 lecture, 1 laboratory. Prerequisite: AE 121 or demonstrated equivalent ability.

**AE 124 Small Power Units (2)**

Operating principles of the small internal combustion engine. Maintenance and troubleshooting applications of small power units to mowers and other landscape equipment. Repair procedures related to economic justifications. 1 lecture, 1 two-hour activity.

**AE 128 Agricultural Mechanics (3)**

Introduction to agricultural engineering and mechanized agriculture. Career opportunities. Problem solving techniques. Selection of materials for agricultural construction. Laboratory skills development in wood, metal, concrete and pipework. 2 lectures, 1 laboratory. Prerequisite: Majors only, MATH 113 or equivalent, college drafting or concurrent enrollment and college algebra.



**AE 131 Agricultural Surveying (2)**

Introduction to basic surveying techniques as applied to agriculture. Keeping field notes; land measurement by tape; differential and profile leveling; contour and plane table mapping; land surveying and identification; fundamentals of land grading. 1 lecture, 1 laboratory. Prerequisite: MATH 103.

**AE 133 Agricultural Drafting (3)**

Technical drawing oriented toward working drawings of agricultural engineering components and systems. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. 1 lecture, 2 laboratories. Not open for credit to students with previous college level drafting course work.

**AE 134 Agricultural Electrification (3)**

Fundamentals of circuits, electric wiring and code regulations, electrical distribution and the wiring of agricultural structures. The selection, installation, and maintenance of electric motors. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: MATH 103 or MATH 113 or equivalent.

**AE 141 Agricultural Tractors and Equipment Skills (3)**

Skills in the practical operation of tractors and equipment. Supervised operation on modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

**AE 142 Agricultural Power and Machinery Management (3)**

Evaluation of agricultural tractors and machinery performance. Power applications and hydraulic systems. Evaluation of performance of tillage, seeding and planting, weed control, hay and grain harvesting, and farm processing equipment. Emphasis on management. Selection, operation, maintenance, and cost analysis. 2 lectures, 1 laboratory. Prerequisite: MATH 103.

**AE 143 Power and Machinery (4)**

Performance of tractors and machinery. Evaluation of tillage, planting, and harvesting operations. Analysis and development of optimum mechanical systems. 3 lectures, 1 laboratory. Prerequisite: MATH 114 or equivalent, AE 128.

**AE 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**AE 231 Agricultural Building Construction (3)**

Development of practical skills in carpentry and light construction. Selection of materials. Agricultural buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: AE 128 or consent of instructor.

**AE 232 Agricultural Structures Planning (3)**

Environmental factors affecting crop storage structures and animal housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. Application of solar energy to agriculture. 2 lectures, 1 laboratory. Prerequisite: PHYS 132 and college drafting.

**AE 234 Agricultural Power Transmission and Mechanics (3)**

Elements in the utilization and transmission of power in agriculture with emphasis on mechanics. 2 lectures, 1 laboratory. Prerequisite: AE 143, PHYS 121.

**AE 236 Principles of Irrigation (4)**

Land grading design, operation, management, and evaluation of irrigation methods. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: MATH 141, AE 237, SS 121, a computer programming course.

**AE 237 Engineering Surveying (2)**

Selection, care and use of tapes, levels and transits. Keeping field notes; land measurements by tape; differential and profile leveling; and the plotting of profiles. Introduction to the transit; field operation; introduction to traverses. 1 lecture, 1 field period. Prerequisite: MATH 115 or equivalent; college drafting.

**AE 238 Engineering Surveying (2)**

Traverses by transit-tape. Adjustments, coordinates, and area calculations. Earthwork and landgrading. Topographic mapping. Electronic distance measurements. Land legal descriptions. 1 lecture, 1 field period. Prerequisite: AE 237.

**AE 239 Engineering Surveying (2)**

Parabolic curves, circular curves, cross sectioning, setting slope stakes, measuring earth volume, cuts and fills as applied to road beds, public land surveys, photogrammetry. 1 lecture, 1 field period. Prerequisite: AE 238.

**AE 240 Agricultural Engineering Laboratory (1-2)**

Total credit limited to 4 units with no more than 2 units in any one quarter. 1 or 2 laboratories.

**AE 301 Closed Circuit Hydraulics (3)**

Proper selection and maintenance of machine components using standardized design procedures and manufacturer's design literature. 2 lectures, 1 laboratory. Prerequisite: AE 234 or AE 312.

**AE 312 Hydraulics (4)**

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, ME 211.

**AE 315 Hydrology (3)**

Collection, organization and use of precipitation and runoff data, flood frequency and economics of structures, stream gauging and use of hydrograph, principles of groundwater management and flood routing. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

**AE 321 Agricultural Safety (3)**

Principles of agricultural safety; accident causation and prevention; hazard identification and abatement; laws and regulations; machinery, electrical, chemical, livestock, shop and fire safety; rural crime prevention; safety program development. 3 lectures. Prerequisite: Junior standing.

**AE 323 Agricultural Products Handling (3)**

Application of product handling techniques and equipment to the processing of agricultural commodities. 2 lectures, 1 laboratory. Prerequisite: PHYS 123 or consent of instructor.

**AE 324 Principles of Agricultural Electrification (4)**

R-L-C circuit fundamentals. Applications of electricity in agriculture including circuit fundamentals. Materials, code regulations, electrical measurements, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: AE 134, MATH 115, PHYS 123.

**AE 326 Off-the-Road Locomotion (3)**

Sources and systems for supplying power to off-the-highway vehicles. Theory of traction, soil equipment mechanics, prime mover and implement combinations. 2 lectures, 1 laboratory. Prerequisite: AE 143, ME 211, ME 302.

**AE 331 Irrigation Theory (3)**

Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: AE 236, SS 121, MATH 141 or approval of instructor.

**AE 333 Engineering Properties of Agricultural Materials (3)**

Principles of analyzing the mechanical, electrical, thermal, rheological and optical characteristics of agricultural materials. 2 lectures, 1 laboratory. Prerequisite: CE 204, PHYS 133.

**AE 335 Agricultural Power (3)**

Principles of spark ignition and compression ignition engines and related accessories. Service, trouble-shooting, and repair procedures. 2 lectures, 1 laboratory.

**AE 337 Landscape Irrigation (3)**

Design of landscape irrigation systems including soil factors, hydraulics, site information, selection of system components, back flow prevention, plumbing codes and cost estimating. 2 lectures, 1 laboratory. Prerequisite: SS 121 or consent of instructor.

**AE 338 Computer Interfacing and Measurements (3)**

Use of engineering measurements and logic control. Transducers, signal processors, and computer interfacing for agricultural engineering. 2 lectures, 1 laboratory. Prerequisite: EE 201, EE 261, ENGR 251.

**AE 339 Agricultural Mechanics Skills (2)**

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 2 lectures, 2 laboratories weekly for five weeks per session—two sessions per quarter. Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or by consent of instructor.

**AE 340 Irrigation Water Management (4)**

Soil-plant-water relationships, consumptive use rates and irrigation schedules, water quality, salinity and drainage, water rights and irrigation institutions. Evaluation of onfarm irrigation systems; water measurement, wells, and pumps. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: SS 121, MATH 103 or equivalent.

**AE 341 Gasoline Engine Diagnosis (3)**

Use of modern engine testing equipment in the evaluation of agricultural engine components and accessories such as: cylinder condition, ignition systems, electrical systems, and fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent.

**AE 342 Diesel Fuel Systems (3)**

Use of modern test and service equipment in evaluating and servicing diesel fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent.

**AE 343 Project Analysis (5)**

Analysis of projects for structural design, applied elements of statics, dynamics, strength materials, fabrication, and fasteners. 4 lectures, 1 laboratory. Prerequisite: AE 133 or equivalent, PHYS 121, AE 234.

**AE 344 Agricultural Equipment Projects (3)**

Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AE 343.

**AE 345 Aerial Photogrammetry (3)**

Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Familiarization with geological, agricultural, land and crop management, engineering surveys, construction data, topographic detail, drainage elevation and control. Color photo techniques and uses for pest and disease location and control. 2 lectures, 1 laboratory. Prerequisite: MATH 103 or MATH 114.

**AE 347 Principles of Agricultural Machinery (4)**

Principles and evaluation of agricultural power units and machines. Soil equipment mechanics and tractor-implement combinations. 3 lectures, 1 laboratory. Prerequisite: AE 143, AE 343.

**AE 392 Wells and Pumps (3)**

Ground water resources, drilling methods, and development of wells. Kinds of pumps and their agricultural applications. Selection of pumping systems for different water sources. Design of domestic water systems. Water quality standards and water conditioning. 2 lectures, 1 laboratory. Prerequisite: AE 340 or consent of instructor.

**AE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**AE 403 Agricultural Systems Engineering (3)**

Engineering principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. 3 lectures. Prerequisite: IE 314, MATH 242, ENGR 251, STAT 321.

**AE 414 Irrigation Engineering (4)**

Design of farm and project irrigation systems. Influence of soils, crops, climate, and costs on the frequency, rate, and duration of economical water delivery. Pipeline and ditch distribution systems; reservoirs, and pumps; economics of systems and components. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 236, AE 312, AE 331.

**AE 421 Equipment Engineering (4)**

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: CE 205, ME 212, ETWT 144.

**AE 422 Equipment Engineering (3)**

Analysis and design of agricultural equipment with emphasis on man-machine-plant-automata relationships and concepts. 2 lectures, 1 laboratory. Prerequisite: AE 421.

**AE 425 Computer Controls for Agriculture (3)**

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: CSC 110 or AM 250.

**AE 427 Agricultural Process Engineering (3)**

Agricultural engineering principles applied to air, water, air-water mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures, 1 laboratory. Prerequisite: AE 312.

**AE 432 Agricultural Buildings (4)**

Selection of buildings, storage units, and related equipment for production agriculture. Design of beams and column members in wood and steel. Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, AE 231, AE 343.

**AE 433 Agricultural Structures Design (4)**

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory. Prerequisite: AE 232, CE 205.

**AE 435 Drainage (3)**

Flow of water in porous media; intrinsic permeability and hydraulic conductivity; flow nets; wells and ground water; design of sub-surface drains. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 331, or AE 340 and consent of instructor.

**AE 440 Agricultural Irrigation Systems (4)**

Basic irrigation system design for nonengineers. Hydraulics, pump selection, irrigation hardware, canals, chemical injection. Layout of drip, sprinkler and surface irrigation systems. Miscellaneous course fee required— see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: AE 340.

**AE 445 Remote Sensing (3)**

Digital analysis of LANDSAT images. Topographic map production with stereoscopic map plotting instruments. Emphasis on laboratory experience. No previous computer experience required. 2 lectures, 1 laboratory. Prerequisite: AE 345.

**AE 461, 462 Senior Project (2) (2)**

Solution of an engineering problem in agriculture. Involves research methodology: problem statement, analysis, synthesis project design, construction (when feasible), and evaluation. Project requires 120 hours with a minimum of faculty supervision.

**AE 463 Undergraduate Seminar (2)**

Group discussion of current agricultural engineering topics presented by individual members of the class. Placement opportunities and requirements. 2 seminars.

**AE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**AE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Graduate standing and consent of instructor.

**AE 521 Engineering of Agricultural Systems (4)**

Problem solving by analyzing the need, establishing boundaries and developing creativity. Examples worked through in practicability analysis, transportation problems, linear programming and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Graduate standing.

**AE 522 Agricultural Process Control/Microprocessors (4)**

Engineering principles involved in handling, conditioning, and storage of agricultural products. Advanced practical analysis and design of agricultural systems from harvest to utilization. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**AE 533 Advanced Irrigation System Design (4)**

Design, evaluation, and operation of irrigation systems. Current advancements in equipment and theory. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, AE 340 or consent of instructor.

**AE 581 Graduate Seminar in Agricultural Engineering (3)**

Current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology emphasized in problem solution. 3 seminars.

**AERO—AERONAUTICAL ENGINEERING****AERO 102 Introduction to General Aviation (3)**

GEB F.2.

Fundamentals of aerodynamics and principles of flight. Introduction to power systems and instrumentation used by general aviation aircraft. Principles of air navigation. Interpretation of weather data, uses of flight computer, applicable Federal Aviation Regulations, subjects covered in the private pilot's examination. Not acceptable as a technical elective for engineering students. Not open for technical credit to Aeronautical Engineering students. 3 lectures.

**AERO 121, 122, 123 Aerospace Fundamentals (1) (1) (1)**

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 laboratory.

**AERO 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**AERO 202 Problems in Aeronautical Engineering (2)**

Introduction to problem solving techniques in aeronautical engineering. Primary emphasis on the solution of problems encountered in the profession. Subjects covered: aircraft performance, take-off and landing distance, rate of climb and endurance, and other such problems associated with the design and performance of aircraft. 2 laboratories.

**AERO 240 Additional Engineering Laboratory (1-2) (CR/NC)**

Total credit limited to four units, with not more than two units in any one quarter. Credit/No Credit grading. 1 or 2 laboratories.

**AERO 301, 302, 303 Aerothermodynamics (5) (5) (3)**

Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall and winter; 3 lectures, spring. Prerequisite: ME 211, MATH 242.

**AERO 304 Experimental Aerothermodynamics (2)**

Laboratory experiments verify the momentum and energy equations; fan performance, boundary layer measurements, diffuser performance, heat transfer and solar collector performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: AERO 301.

**AERO 305 Aerodynamics I (3)**

Introduction to applied aerodynamics. Primary emphasis on aircraft, performance and basic aerodynamics. Subjects covered: atmosphere, wing theory, drag, airfoil theory, static flight performance and dynamic flight performance. 3 lectures. Prerequisite: MATH 242 and concurrently AERO 301.

**AERO 306 Aerodynamics II (3)**

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Performance analysis. 3 lectures. Concurrent: AERO 303.

**AERO 307 Wind Tunnel and Flight Test Laboratory (2)**

Course includes wind tunnel testing techniques such as measurement of lift, drag, pressure distribution, and dynamic response of vehicles. Test techniques and data reduction of flight systems. 1 lecture, 1 laboratory.

**AERO 324 Stress Analysis (4)**

Truss analysis; torsion of space frames and box beams. Shear and bending of straight and curved beams. Moment and product of inertia; Mohr's circle. Normal and shear stresses for beam bending about non-principal axes; the shear center. Beam columns under various loading and support conditions. Laboratory projects dealing with aerospace structures. 3 lectures, 1 laboratory. Prerequisite: MATH 242, CE 204, CE 205.

**AERO 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**AERO 401 Propulsion Systems (4)**

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 401: 3 lectures, 1 laboratory. Prerequisite: AERO 404.

**AERO 404 Gas Dynamics (4)**

Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 4 lectures. Prerequisite: AERO 303.

**AERO 405 Aerodynamics III (3)**

Review of gas dynamics, shock-wave and boundary-layer interaction, compressible subsonic and transonic flows over airfoils, 2-dimensional supersonic flows around thin airfoil, finite wing in supersonic flow. 3 lectures. Prerequisite: AERO 404.

**AERO 408 Advanced Flight Vehicle Structural Analysis (4)**

Deformation of determinate and indeterminate structures. Virtual work. Dummy load method, Maxwell-Betti reciprocal theorem, Castiglano's theorem. Introduction to matrix methods. 3 lectures, 1 laboratory. Prerequisite: AERO 324, MATH 318.

**AERO 409 Flight Test (3)**

Flight test instrumentation, obtaining of data and methods of data reduction for determining aircraft and engine performance, aircraft stability and control and structural integrity. Evaluation of factory data, including weight and balance compliance with specifications. 1 lecture, 2 laboratories. Prerequisite: AERO 306.

**AERO 411 Space Technology (3)**

Motion of a body in the central force field. Space vehicle trajectories, guidance systems, power generators for interplanetary travel, structural loading, and principles of space vehicle design. 3 lectures.

## 280 AERO

### AERO 416 Unconventional Aircraft (3)

Introduction to analysis of rotary wing aircraft, VTOL, STOL, and lifting body vehicles. Types of flight control mechanism. Performance and stability of vehicles. 3 lectures. Prerequisite: AERO 306.

### AERO 420 Stability and Control of Aircraft I (3)

Equations of motion of the airplane in six degrees of freedom and the aerodynamic forces involved. Static longitudinal and directional stability. Lateral motion and control. 3 lectures. Prerequisite: AERO 306.

### AERO 421 Stability and Control of Aircraft II (3)

General equations of unsteady motion, the stability derivatives, longitudinal and lateral stability of uncontrolled motion, aircraft response to controls. 3 lectures. Prerequisite: AERO 420.

### AERO 444, 445 Flight Vehicle Design (4) (4)

Preliminary layout of a typical transport aircraft and a space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. 2 lectures, 2 laboratories. Prerequisite: AERO 306.

### AERO 461, 462 Senior Project (2) (3)

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

### AERO 464 Industry Seminar (1)

Speakers from the aircraft and aerospace industry invited to present current topics within the industry. 1 seminar.

### AERO 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### AERO 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### AERO 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

### AERO 501 Advanced Flight Dynamics (3)

Derivation of full six degrees of freedom of motion of missiles and space vehicles in both linear and nonlinear applications; closed form and computer numerical integrations; advanced dynamic flight testing and dynamic wind tunnel testing. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

### AERO 503 Advanced Structural Analysis (3)

Deformations of aircraft structures due to static and dynamic loads. Computation of natural mode shapes and frequencies. Determination of dynamic stress fields in aircraft due to transient motions caused by external forces. 3 seminars. Prerequisite: ME 427 or senior level structural design course, graduate standing or consent of instructor.



**AERO 505 Theoretical Aerodynamics (3)**

Fundamentals of analytical aerodynamics, potential flow, vortex theory, circulation, Kutta Joukowski theorem, lifting line theory, three-dimensional lift and drag of wings, performance, stability and control. 3 seminars. Prerequisite: AERO 306 or equivalent, graduate standing or consent of instructor.

**AERO 506 Elements of Rocket Propulsion (3)**

Analysis and design of liquid and solid rockets using basic design parameters such as droplet atomization, droplet and particle combustion, heat transfer, combustion stability and control, and thermochemical computations. 3 seminars. Prerequisite: AERO 401 or equivalent, graduate standing or consent of instructor.

**AERO 508 Computational Fluid Dynamics (3)**

Numerical solution by finite differences of partial differential equations in fluid dynamics. Application to boundary layer and transport processes. 3 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

**AERO 509 Introduction to Boundary-Layer Theory (3)**

Concept of the boundary-layer. Boundary-layer equations, the similarity concept, fundamental similarity solutions, the thermal boundary-layer. 3 lectures. Prerequisite: AERO 303 or equivalent, graduate standing or consent of instructor.

**AERO 570 Selected Advanced Topics (3)**

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**AERO 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned an aeronautical project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. Appropriate experimental or analytical thesis may be accepted.

**AG—AGRICULTURE****AG 100 Agriculture Enterprise Project (1-4) (CR/NC)**

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Registration is through department offices and subtopics will list the department supervising the project. Credit/No Credit grading. Repeatable.

**AG 243 Competitive Intercollegiate Rodeo (2) (CR/NC)**

Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo. Consent of coach required.

**AG 301 Agriculture and American Life (3)****GEF F.2.**

Relationship of agriculture and natural resources to man and his society. Impact of soil, water, and land uses on animal and crop production within the United States. Relative importance of resources used and commodities produced. Not open to students with majors in agriculture and natural resources. 3 lectures. Prerequisite: Junior standing.

**AG 339 Internship in Agriculture (1-12) (CR/NC)**

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

## 282 AGED

### AG 500 Individual Study (1-3)

Advanced independent study planned and completed under the direction of a member of the school faculty. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

### AG 539 Graduate Internship in Agriculture (1-9)

Application of theory to the solution of problems of agricultural production or related businesses in the field. The student will analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty adviser before the internship commences. Prerequisite: Consent of adviser.

### AG 599 Thesis (1-9)

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

## AGED—AGRICULTURAL EDUCATION

### AGED 202 Introduction to Agricultural Education (2)

Overview of agricultural education programs including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching. 2 lectures.

### AGED 303 F.F.A. Programs and Activities (2)

Implementation processes and operational procedures for conducting an F.F.A. Chapter activities program appropriate to community, school and student needs. F.F.A. leadership training, proficiency awards, foundation programs and educational field days. 2 activities. Prerequisite: AGED 202 and consent of instructor.

### AGED 339 Supervised Agricultural Experiences (2)

Supervised observation and participation in public school and/or agricultural industry. Exposure to processes and procedures for supervising rural youth organizations and occupational experience programs. 2 activities. Prerequisite: AGED 202 and consent of instructor.

### AGED 350 Undergraduate Field Experience (1)

Practices in education and motivational techniques used for teaching bilingual (Spanish/English) students interested in agriculture and technology. Repeatable, total credit limited to 3 units. 1 lecture. Prerequisite: Junior standing or consent of instructor.

### AGED 351 Undergraduate Field Experience (1)

Practices in education and motivational techniques used for teaching bilingual (Spanish/English) students interested in agriculture and technology. Repeatable, total credit limited to 3 units. Prerequisite: Junior standing or consent of instructor.

### AGED 412 Teaching Resources (1)

Survey of teaching resources for the vocational agriculture teacher. Utilization of time management principles in the development of effective course and unit planning. Systematic filing practices, use of audiovisual materials. 1 lecture. Prerequisite: Senior standing.

### AGED 424 Organizing and Teaching Agriculture (3)

Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AGED 438 and consent of instructor.

### AGED 438 Instructional Processes in Agricultural Education (3)

Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

**AGED 440 Student Teaching in Agricultural Education (6-12)**

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total limited to 18 units.

**AGED 441 Student Teaching Practicum (2)**

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

**AGED 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**AGED 463 Undergraduate Seminar (2)**

Group discussion of current agricultural education topics presented by individual class members. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 seminars.

**AGED 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AGED 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**AGED 513 Field Experience—Vocational Agriculture (1-3)**

Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

**AGED 520 Program Development in Agricultural Education (3)**

Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars.

**AGED 521 Natural Resources Management for Educators (3) (Also listed as NRM 521)**

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to each component as they relate to the present perception of today's resource base, use demands, and projected utilization. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**AGED 522 Instructional Programs in Agricultural Mechanics (3)**

Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 seminar, 2 laboratories.

**AGED 580 Special Problems in Agricultural Education (1-3)**

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

## AM—AGRICULTURAL MANAGEMENT

### AM 099 Farm Records (4)

Farm record keeping for tax, management and credit purposes using the cash method of accounting. An overview of the accrual system and measures of farm profits. May not be substituted for AM 321 or AM 322. 3 lectures, 1 two-hour laboratory. To be taken by technical students.

### AM 101 Introduction to Agricultural Management (3)

Relationship of agricultural management to characteristics, problems and challenges of agriculture. Student report on background, goals and educational plan. 3 lectures. Prerequisite: Agricultural Management major of freshman standing or consent of instructor.

### AM 102 Introduction to Agricultural Economics (3)

Introduction to the economic aspects of agricultural management. Role of resources in agricultural production. Survey of trade, policy, and marketing activities of agriculture. 3 lectures.

### AM 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### AM 201 Agricultural Business Sales and Service (3)

Growth and opportunities in agricultural sales. Factors involved in developing sales program for the farm operation. Application of successful selling principles and practices in providing farm operators with agricultural materials, supplies, equipment and services. Consideration given to sales and service for farm related businesses and nonagricultural customers. Selling aspects involved in marketing of farm products by farm related businesses. 3 lectures.

### AM 203 Agricultural Business Organization (3)

Development, types and forms of farm related businesses. Agricultural businesses considered from standpoint of primary functions, services and problems including such factors as business organization information systems, labor and production planning. Emphasis on California farm related industries. 3 lectures.

### AM 212 Agricultural Economics (3)

Changes in agriculture and agricultural production in response to changing economic conditions. Optimum methods of agricultural production. Impact of technological change. Evaluating market structure and price formulating factors for agricultural products and inputs. 3 lectures. Prerequisite: ECON 211.

### AM 213 Agricultural Economic Analysis (4)

Role of price in the economy, the firm as a decision-making unit, the production function, single input-output analysis, substitution relationships, products combinations, risk analysis, consumption and market demand influence, population and technological changes. 4 lectures. Prerequisite: AM 212, MATH 114.

### AM 230 General Agricultural Management (3)

General introduction and overview of agricultural management; principles and procedures in planning, organizing and managing farm related agribusinesses. For non-Agricultural Management majors. 3 lectures.

### AM 250 Computer Application to Agriculture (3)

GEB F.1.

Use of library programs available for agriculture. Use of auxiliary equipment available at commercial computer centers. Statistical and other computer programs applied to agriculture problems. 3 lectures.

**AM 300 Successful California Farms (2)**

Visits to successful California farms involving many types of farming. Study of farm resources and organization, techniques of operation, yields, problems. Different regions visited on different trips. Total credit limited to 4 units.

**AM 301 Agricultural Marketing (3)**

Agricultural commodity marketing systems from farm to consumer. Middlemen types and marketing alternatives. Role of futures markets in pricing and risk minimization. Storage, transportation and grading systems. Selected topics such as foreign trade and marketing orders. 3 lectures. Prerequisite: ECON 201 or ECON 211.

**AM 302 Agricultural Cooperative Organization and Management (3)**

Purpose, kinds, organization and management of agricultural cooperatives. Emphasis on California cooperatives, their characteristics, operation and future. One-day field trip visiting agricultural cooperatives included. 2 lectures, 1 two-hour laboratory.

**AM 305 Agricultural Resources (3)**

Survey of agricultural production areas of United States from standpoint of physical resource, markets, economic advantages, and problems. Appraisal of area problem from standpoint of land economic principles. 3 lectures. Prerequisite: ECON 201 or ECON 211.

**AM 307 World Agricultural Resources (3)**

World agricultural production areas with emphasis on natural and human resources, existing production, economic implications, population growth and potential food supply. 3 lectures. Prerequisite: ECON 201 or ECON 211.

**AM 310 Agricultural Credit and Finance (3)**

Fundamentals of financing California's agricultural industry. Principles of making investment decisions and costs of credit. Developing credit strategies within the framework of sources of credit and types of loans available to farms, ranches, and agribusiness firms. 3 lectures. Prerequisite: One quarter of accounting, farm records, or consent of instructor.

**AM 312 Agricultural Policy (3)**

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of government's influence in the planning and practices of farmers and agricultural businesses. 3 lectures. Prerequisite: ECON 211.

**AM 314 Fair Management (3)**

Principles and procedures in organizing, managing and promoting fairs. Emphasis on California and Western fairs. Career opportunities, programs and problems in fair management and growth of fairs in America. A one-day field trip is required. 3 lectures.

**AM 315 Land Economics (3)**

Supply of land, population pressure on land, input-output relations affecting land use, economic returns, land values, development and investment costs, locational factors, conservation, institutional factors, leasing, land use planning, taxation, public regulations. 3 lectures. Prerequisite: ECON 201 or ECON 211.

**AM 317 Agriculture—Consumer Relationships (3)**

Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to nonfarm persons. Consumer education programs and procedures. 3 lectures.

**AM 318 Agricultural Trade Policies (3)**

Analysis of American trade policies and their relationship to agriculture. International trade pacts and their influence on agricultural production and marketing. 3 lectures. Prerequisite: ECON 201 or ECON 211, AM 301.

**AM 321 Farm Records (4)**

Fundamentals of record keeping, kinds of records, inventory, depreciation, payrolls, cash and accrual basis of income tax reporting, financial statements and analysis. 3 lectures, 1 two-hour laboratory. Prerequisite: ECON 201 or ECON 211.

**AM 322 Principles of Farm Management (4)**

Organization and operation of farm and ranch businesses. Identification of factors affecting profitability and implementation of them in the evaluation of the business to increase efficiency and profit. Application of budgeting to laboratory farms and independent analysis of a farm for the term report. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 321 or ACTG 211.

**AM 323 Agricultural Business Managerial Accounting (4)**

Agricultural business management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 two-hour laboratory. Prerequisite: ACTG 211.

**AM 324 Agricultural Property Management and Sales (4)**

Land economic, legal and real estate principles in the investment, development, leasing, mortgaging and transferring of agricultural real estate. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 310 or consent of instructor.

**AM 325 California Agriculture (3)**

Agricultural regions of California considered from standpoint of physical resources, crops and livestock, size, tenure, water problems, relation to urban areas, land law, land development, and property taxation. 2 lectures, 1 two-hour laboratory. Prerequisite: ECON 201 or ECON 211.

**AM 326 Farm Appraisal (4)**

Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 3 lectures, 1 two-hour laboratory. Prerequisite: ECON 211 and junior standing.

**AM 336 Commodity Markets in Agricultural Business (3)**

Commodity market history, performance, and use in management of agricultural business. Techniques of analysis, hedging, speculation with applications to the agricultural business firm. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 212 or consent of instructor.

**AM 360 Agricultural Management Research Methods (3)**

Concepts of research methodology and data presentation in agricultural management. The scientific method and its application to problems in the field. Selection of methodology compatible with the problem. Overview of research from conceptualization to finalized report. 3 lectures.

**AM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**AM 401 Agricultural Labor Relations and Personnel Management (4)**

Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing.

**AM 404 Agricultural Marketing Management (3)**

Marketing management applied to agricultural and food industries. The marketing concept, the role of today's middlemen and the growing importance of consumerism, ecology and conservation in today's changing market place. Exploration of marketing mix decisions including planning, product management, pricing, promotion and distribution. 3 lectures.

**AM 405 Agricultural Marketing Research Methods (3)**

Collecting, tabulating and analyzing data for use in market research and sales. Techniques for determining market potential. Surveys, trends, correlation, market factor derivation, test marketing. Routing techniques, sampling procedures. 3 lectures. Prerequisite: AM 250, STAT 211 or STAT 251.

**AM 406 Agricultural Business Communication (3)**

Principles, methods and materials for communicating ideas, information and skills to management, staff members, stockholders, customers and general public. Agricultural business public relations programs. Organization and presentation of surveys, studies, reports and publications. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 404 or consent of instructor.

**AM 409 California Agricultural Law (3)**

Historical and current sources of law, examination of judicial systems, application of contracts, agency, labor law, torts, property and water law, partnerships, corporations and corporate finance applicable to agricultural enterprises. 3 lectures. Prerequisite: BUS 201, senior standing or consent of instructor.

**AM 413 Crop Management Problems (3)**

Management problems of crop farms and orchards: crop enterprise costing procedures, equipment costing and replacement, scheduling of operations to obtain efficiencies, determination of most profitable rotations and levels of input use, planning for changes in operation, orchard development, investment analysis. 3 lectures. Prerequisite: AM 322.

**AM 415 Livestock Management Problems (3)**

Analysis of actual livestock enterprise; budgeting a ranch by enterprises; analysis of internal problems such as bull purchase economics, feed buying chart, feedyard economics, cattle price relationships, livestock systems. 3 lectures. Prerequisite: AM 322.

**AM 416 Dairy Management Problems (3)**

Analysis of actual dairy enterprise; budgeting a dairy farm by enterprises; analysis of problems such as load by milk-feed analysis, value of milk quotas, most profitable concentrate to hay feeding. 3 lectures. Prerequisite: AM 322.

**AM 421 Agricultural Business Operations Analysis (4)**

Principles and procedures in agricultural business operations analysis and research. Evaluation of programs and problems to achieve optimal decisions. Production and financial data, statistics, pricing, costs, inventories, production level, and plant expansion or contraction. 4 lectures. Prerequisite: AM 213, AM 250, STAT 212 or STAT 251.

**AM 427 Agricultural Estate Planning (3)**

Principles and procedures in agriculture estate planning and conservation. Determining agriculture estate assets, taxes, property valuation, property transfers, beneficiaries and needs, gifts, insurance, business estate, employee estate, wills, trusts, and administration of trusts and estates. 3 lectures. Prerequisite: AM 324.

**AM 431 Large Farm Accounting (4)**

Application of commercial accounting process to large farm accounting problems. Emphasis will be placed on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to the farm will be stressed. 3 lectures, 1 two-hour laboratory. Prerequisite: ACTG 211.

**AM 433 Agricultural Price Analysis (3)**

Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in price forecasting and analysis. 2 lectures, 1 two-hour laboratory. Prerequisite: STAT 212 and AM 250.

**AM 435 Linear Programming in Agriculture (3)**

Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 250.

**AM 440 Field Studies in Agricultural Management (2)**

Visitation to selected agricultural businesses. Organization, operation, services and problems considered. Prerequisite: Senior standing or consent of instructor.

**AM 450 Agricultural Strategy Formulation (4)**

Development of strategy for farms and farm related businesses where uncontrollable environment makes output and results highly unpredictable; emphasis on the total enterprise; case analysis. 4 lectures. Prerequisite: AM 310.

**AM 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**AM 463 Undergraduate Seminar (2)**

Individual or group presentation for discussion of subjects and problems within the Agricultural Management field. 2 seminars.

**AM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**AM 510 World Agricultural Development (3)**

Special problems of agriculture in less-developed countries considering the role of economic, social and institutional policies in directing development. 3 seminars. Prerequisite: AM 307 or AM 315.

**AM 515 International Agricultural Marketing (3)**

Organization and function of international agricultural markets with emphasis on developing countries. Factors inhibiting development of an improved agricultural market structure. 3 seminars. Prerequisite: AM 301, AM 307 or consent of instructor.

**AM 516 Communication for Change in Developing Countries (3)**

Analysis of literature, techniques and procedures for planning and carrying out agricultural information programs in developing countries. Current relevant information for foreign agricultural producers. 3 seminars. Prerequisite: AM 307.

**AM 544 Advanced Farm and Ranch Management (4)**

Application of microeconomic, quantitative, and qualitative methods to the evaluation of problems peculiar to the management of the agricultural production unit. Emphasis on methods which will strengthen decision making for efficient resource utilization to enhance quantity and minimize cost of production. 4 seminars. Prerequisite: Second year MBA standing.

**AM 553 Agricultural Policy and Program Analysis (4)**

Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars. Prerequisite: Second year MBA standing.



**AM 554 Managing Price Risk in Agribusiness (4)**

Examination of alternatives available to the agribusiness manager to manage price risk. Use of forward contracts, cooperative seasonal pools, and hedging with futures contracts and options. Futures markets, their function and operation. Analysis of cash-futures price relationships, hedging guidelines, and other topics necessary for successful hedge program execution. Student involvement in a speculation and hedging simulation. 4 seminars. Prerequisite: Second year MBA standing.

**AM 563 Agricultural Trade and Market Development (4)**

Changing agricultural trade prospects in a dynamic world economy. Interface between strategies of government and private firms to create and expand foreign markets for U.S. agricultural products. Impacts of agricultural trade policies, agricultural market development, and the activities of agricultural export marketing firms. 4 seminars. Prerequisite: Second year MBA standing.

**AM 564 Agribusiness Managerial Leadership and Communication (4)**

Small groups analyze an agribusiness case situation with formal oral/written reports to management required. Emphasis on communication skills and leadership qualities, identifying key success requirements. Includes on-site workshop at a large California farm. 4 seminars. Prerequisite: Second year MBA standing.

**AM 581 Graduate Seminar in Agricultural Management (3)**

Group study of selected developments, trends and problems in the field. 3 seminars.

**ANT—ANTHROPOLOGY****ANT 201 Cultural Anthropology (3)**

GEB D.4.a.

Meaning and significance of culture to human beings. Examination of how cultures differ in their impact on behavior. How cultures develop and change. 3 lectures.

**ANT 202 World Prehistory (3)**

Development of human cultures in both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 3 lectures.

**ANT 203 Physical Anthropology (3)**

Facts and problems of human evolution; fossil man; primate evolution and social behavior; human variation. 3 lectures.

**ANT 301 Applied Anthropology (3)**

Application of the basic concepts of anthropology to problems of development. Cross-cultural interaction and culture change using the case-study approach. 3 lectures. Prerequisite: Ant 201 or consent of instructor.

**ANT 310 California Archaeology (3)**

California Indians; field studies in locating, surveying, and analyzing aboriginal sites; excavation of a site; laboratory techniques for recording, preserving, and reporting of artifacts; relating observations and finds to the natural environment in which a site is located. Integrating knowledge of natural and social sciences to use of archaeology. 2 lectures, 1 laboratory.

**ANT 325 Material Culture (3)**

Description of processes of invention and diffusion. Role of environment and primitive technology on culture. Major preindustrial inventions and their social correlations. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

**ANT 333 Language and Culture (3)**

Interrelation between language and other facets of culture. Speech in its social setting. Emphasis on social and cultural factors which influence language variation and language diversity. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

## 290 ARCE

### ANT 341 Comparative Societies (3)

Comparative study of contemporary peoples and cultures representing the major cultural types. 3 lectures. Prerequisite: ANT 201.

### ANT 360 Human Cultural Adaptation (3)

GEB D.4.b.

Examination of social and cultural systems as means by which humans adapt to their physical, biotic and social environments. 3 lectures.

### ANT 450 Area Studies (3)

Comparative analysis of cultures within a selected region (e.g., Southeast Asia, Subsaharan Africa etc.). Up to 12 units may be taken. 3 lectures.

### ANT 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## ARCE—ARCHITECTURAL ENGINEERING

### ARCE 221 Elementary Structures (3)

Forces on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. 3 lectures. Prerequisite: PHYS 131, MATH 142.

### ARCE 222 Mechanics of Structural Members (3)

Stress-strain relationships; stresses and deformations in structural members due to axial force, torsion, and moment. 3 lectures. Prerequisite: ARCE 221.

### ARCE 223 Structural Analysis I (3)

Statically determinate and indeterminate structures. Approximate methods. Moment distribution. 3 lectures. Prerequisite: ARCE 222.

### ARCE 224 Structures (6)

Stress-strain relationships; stresses and deformations in structural members. Statically determinate and indeterminate structures. Approximate methods. Moment distribution. 6 lectures. Prerequisite: ARCE 221.

### ARCE 225 Dynamics (3)

Static and dynamic loads, rigid body dynamics. Vibrations of structural members. Degrees of freedom and vibration modes. 3 lectures. Prerequisite: MATH 143, ARCE 223.

### ARCE 240 Additional Engineering Laboratory (1-2)

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

### ARCE 301 Stress Analysis Laboratory (1)

Test and analysis of structural materials. Analysis using strain gauges. Displacement measurements. 1 laboratory. Prerequisite or concurrent: ARCE 223.

### ARCE 302 Structural Analysis II (3)

Analysis of statically indeterminate structures. Energy methods. Slope-deflection. Moment distribution including sidesway. 3 lectures. Prerequisite: ARCE 223.

### ARCE 303 Steel Design (3)

Analysis and design of steel structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: ARCE 223.

### ARCE 304 Timber Design (3)

Analysis and design of timber structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: ARCE 223.

**ARCE 305 Masonry Design (2)**

Analysis and design of masonry structures subject to gravity and lateral loads. Load-bearing walls, shear walls, columns and beams, structural details. 2 lectures. Prerequisite: ARCE 223.

**ARCE 306 Matrix Analysis of Structures (3)**

Analysis of statically indeterminate structures by force and displacement methods, including programming for digital computer applications to beams, rigid frames, plane and space trusses, and other structures. 3 lectures. Prerequisite: ARCE 302.

**ARCE 311 Structures for Landscape Architects (3)**

Basic principles of structures and design of landscape structures. 3 lectures.

**ARCE 321 Timber Design (3)**

Timber structures; limitations and potential of the material in relation to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 322 Steel Design (3)**

Design of steel structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 323 Concrete and Masonry Design (3)**

Design of reinforced concrete and masonry structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 361 Structural Computing Laboratory (3)**

Introduction to use of digital computers in structural analysis. 3 laboratories. Prerequisite: ARCH 231, ARCH 232, ARCE 223, EDES 250. Concurrent enrollment in ARCE 302.

**ARCE 362 Structural Systems Laboratory (3)**

Studies in structure-form relationships, geometry and stability of structural systems. 3 laboratories. Prerequisite: ARCE 361.

**ARCE 363 Steel Design Laboratory (3)**

Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCE 302, ARCE 362.

**ARCE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ARCE 409 Survey of Foundation Engineering (3)**

Fundamentals of foundation engineering, evaluation of soil reports, principles of determination of bearing capacity, soil classification, selection of types of foundations, evaluation of expansive properties of foundation soils, discussion of basic laboratory tests. 3 lectures. Prerequisite: ARCE 223.

**ARCE 412 Dynamics of Framed Structures (3)**

Analysis of structures subjected to dynamic loads with single- and multi-degrees of freedom. Development of techniques for analysis of structures in response to seismic, wind, and moving loads. Solution of problems by digital computer. 3 lectures. Prerequisite: ARCE 483.

**ARCE 414 Precast Concrete (3)**

Precast and prestressed concrete principles, materials and techniques of construction. Concrete mixes, forming, casting, finishing, curing and erection methods of precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 lectures. Prerequisite: ARCE 323 or ARCE 444.

## 292 ARCE

### ARCE 415 Concrete Testing Laboratory (1)

Concrete mix design, physical properties of concrete, use of admixtures, concrete batching, concrete curing, testing of concrete and concrete specifications. Includes mix design, batching and physical testing of the designed mixes. 1 laboratory. Prerequisite: ARCE 301.

### ARCE 421 Soil Mechanics (3)

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: ARCE 222, GEOL 201 or consent of instructor.

### ARCE 422 Foundation Design (3)

Soil-bearing capacity and settlement characteristics of soils. Sizing and design of spread footings. Design and analysis of earth-retaining structures. 3 lectures. Prerequisite: ARCE 421.

### ARCE 423 Advanced Foundation Design (3)

Design and analysis of beams on elastic foundations and mat foundations. Pile foundations and sheet pile retaining structures. 3 lectures. Prerequisite: ARCE 422.

### ARCE 433 Economic Analysis for Engineers (2)

Engineering economics, and engineering studies including feasibility and alternate problem analysis. 2 lectures.

### ARCE 444 Reinforced Concrete Design (4)

Design of reinforced concrete structures. Theory and application to building structural systems. 4 activities. Prerequisite: ARCE 301, ARCE 302 and ARCE 363.

### ARCE 445 Prestressed Concrete Design (4)

Design and analysis of prestressed concrete structures. 4 activities. Prerequisite: ARCE 301, ARCE 302, and ARCE 363.

### ARCE 446 Advanced Structural Systems (3)

Multistory buildings, bridges, shells, arches, and cable structures. 3 activities. Prerequisite: ARCE 301, ARCE 306 and ARCE 363.

### ARCE 451 Timber and Masonry Design Laboratory (3)

Selected projects utilizing timber and masonry. 3 laboratories. Prerequisite: ARCE 302, ARCE 304, ARCE 305.

### ARCE 452 Reinforced Concrete Design Laboratory (3)

Selected projects utilizing reinforced concrete. 3 laboratories. Prerequisite: ARCE 444.

### ARCE 453 Projects Laboratory (3)

Final projects by individuals or teams, which may include students from other disciplines or may involve physical modeling and testing. 3 laboratories. Prerequisite: ARCE 363, ARCE 445, ARCE 452.

### ARCE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### ARCE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

### ARCE 481 Structural Models Laboratory (1)

Testing and analysis of structural models in timber, steel, concrete and microconcrete, and plastics. 1 laboratory. Prerequisite: ARCE 301 and ARCE 322 or ARCE 444.

**ARCE 482 Seismic Laboratory (1)**

Laboratory studies utilizing physical models for the analysis of structures subjected to simulated ground motions. 1 laboratory. Prerequisite: ARCE 306, ARCE 481, ARCE 483.

**ARCE 483 Seismic Design (3)**

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. 3 lectures. Prerequisite: ARCE 225, ARCE 306, ARCE 361, MATH 242.

**ARCE 504 Finite Element Method for Building Structures (3)**

Basic concepts of equilibrium and compatibility; stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 lectures. Prerequisite: MATH 242, ARCE 306, or consent of instructor.

**ARCH—ARCHITECTURE****ARCH 102, 103 Environmental Design Fundamentals (2) (2)**

Continuation of EDES 101. Development of abilities in environmental perception, techniques for analysis of the built environment, creative problem solving techniques and graphic communication skills. 2 laboratories. Prerequisite: EDES 101 or consent of department. To be taken concurrently with EDES 110.

**ARCH 106 Materials of Construction (3)**

Use and application of construction processes and materials. 3 lectures.

**ARCH 121 Introduction to Architectural Graphics (3)**

Basic techniques used in graphic communications in the environmental design field. Orthographic, isometric projections, elementary perspective, shades, shadows, value, contrast. 3 laboratories. Prerequisite: EDES 110 or consent of instructor.

**ARCH 202 Creative Problem-Solving (3)**

Techniques for stimulating creative behavior applied to general and environmental problems. Development of problem-solving and decision-making skills and knowledge. 3 lectures.

**ARCH 204 Architectural Theory (3)**

Theories of architectural design. 3 lectures. Prerequisite: EDES 101.

**ARCH 208, 209 Architectural Design Basics (2) (2)**

Introduction to the elements and theories of the environmental and architectural design processes. 2 laboratories. Prerequisite: ARCH 121.

**ARCH 213, 214, 215 Advanced Delineation (2) (2) (2)**

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: EDES 112.

**ARCH 217 History of Architecture (2)**

Overview of the history of world architecture involving its beginning and tracing stylistic manifestations in various cultures including the contemporary scene. 2 lectures. Prerequisite: ENGL 114.

**ARCH 218 History of Architecture (2)**

Architectural developments from 1750 until World War I including neoclassicism, various revivals, technological innovations, arbitrary searches for new forms, and design responses to evolving sociological phenomena. 2 lectures. Prerequisite: ENGL 114.

## 294 ARCH

### ARCH 219 History of Architecture (2)

Architectural design theories and practices from World War I to the present including the Bauhaus, de Stijl, International Style, Fascist ideologies, Regionalism, post World War II amalgamations of twentieth century idioms, and recent reactions to contemporary standardization. 2 lectures. Prerequisite: ENGL 114.

### ARCH 221 Introduction to Environmental Design Science (2)

Introduction to environmental sciences and their impact on man's physical structures. Influence of light, sound, thermal conditions and solar energy on buildings and community design. Energy conservation design factors. 2 lectures. Prerequisite: PHYS 131, PHYS 132, PHYS 137.

### ARCH 231, 232 Architectural Practice (3) (3)

Introduction to building methods and processes and the construction documents used as communication medium. 3 laboratories. Prerequisite: ARCH 106, EDES 112, or consent of instructor.

### ARCH 234 Architectural Practice (6)

Covers the same content as in ARCH 231, 232. Primarily for transfer students. Partial credit may be granted. 6 laboratories. Prerequisite: ARCH 106, EDES 112, or consent of instructor.

### ARCH 237, 238 Photographic Presentation (2) (2)

Photographic and presentation techniques applicable to architectural subjects. For students in the School of Architecture and Environmental Design. 1 lecture, 1 laboratory. Prerequisite: EDES 110, ART 221 or equivalent.

### ARCH 240 Additional Architectural Laboratory (1-2)

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

### ARCH 245 Urban Design in Architecture (3)

Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 114.

### ARCH 251, 252, 253 Architectural Design Fundamentals (3) (3) (3)

Continuation of ARCH 103. Development of concepts pertaining to architectural form, space, structure, and organization. Consideration of function, site, climatic forces, and contextual issues which shape the built environment. One designated field trip required. 3 laboratories. Prerequisite: ARCH 103, EDES 112 or equivalent.

### ARCH 270 Selected Topics (1-3)

Directed group study of selected topics. Class schedule will list topic selected. Open to first-, second-, third-year students. Total credit limited to 6 units. 1 to 3 lectures.

### ARCH 302 Principles of Architectural Design (3)

Basic theory of the art of architecture and its application in architectural design. 3 lectures. Prerequisite: ARCH 204.

### ARCH 307, 308, 309 Building Support Systems (2) (2) (2)

Alternative energy systems and mechanical systems/equipment for the design of architectural spaces including design analysis, systems comparison, and cost benefit studies. 2 lectures. Prerequisite: EDES 250, ARCH 221.

### ARCH 310 Architectural Design Methods and Theories (3)

Analysis of design process, methods of analysis, synthesis, and evaluation in design. Relation between methods used and theories of design. 3 lectures.

**ARCH 312 Home and Community Design (3)**

GEB F.2.

For students not majoring in architecture. Historical development of the home and city and the effect of location, climate, social and technological factors on homes and cities. Considerations and design methodology; furniture, landscape, and relation of home to community environment. 3 lectures.

**ARCH 317, 318, 319 History of Architecture (2) (2) (2)**

All: GEB C.3.

Periods of architecture covering ancient, medieval, and renaissance; philosophies and conditions which influenced them. 2 lectures. May be taken out of sequence. Prerequisite: ENGL 114.

**ARCH 341, 342, 343 Architectural Practice (2) (2) (2)**

Construction systems in masonry, steel, and concrete and combinations of these materials. Preparation of outline specifications. Production of design development drawings. 2 laboratories. May be repeated to 4 units per course. Prerequisite: ARCH 253, ARCH 232.

**ARCH 350 Computer Applications in Architecture (2)**

Applications of computer systems to large-scale data processing, analysis, optimization and evaluation of design program elements. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 351 Architectural Design (5)**

Development of logical analysis and creative abilities through application of skills to the solution of architectural problems with emphasis in theory of architecture. 5 laboratories. Prerequisite: ARCE 223, ARCH 232, ARCH 253.

**ARCH 352 Architectural Design (5)**

Development of logical analysis and creative abilities through application of skills to the solution of architectural problems with emphasis in system integrations. 5 laboratories. Prerequisite: ARCE 223, ARCH 232, ARCH 253.

**ARCH 353 Architectural Design (5)**

Development of logical analysis and creative abilities through application of skills to the solution of architectural problems with emphasis in design process. 5 laboratories. Prerequisite: ARCE 223, ARCH 232, ARCH 253.

**ARCH 358 Prefabrication (2)**

History, theory and application of factory fabricated building systems. Materials and techniques, creative design by such methods. 1 lecture, 1 laboratory. Prerequisite: Third-year standing.

**ARCH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ARCH 401 Toward a Barrier-Free Environment (2)**

Designing for the disabled, physical and attitudinal barriers to environmental accessibility. Attitudes toward deviancy. Principles of normalization/mainstreaming. Legal, moral, and architectural aspects. 1 lecture, 1 activity. Prerequisite: Third-year standing in ARCH, LA, or CRP or consent of instructor.

**ARCH 407 Building Support Systems Laboratory (2)**

Application of preliminary quantitative design methods to the evaluation of alternative building support system solutions in the context of architectural design problems. 2 two-hour laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309.

**ARCH 411 Climatic Determinants of Building Design (2)**

Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: PHYS 132, ARCH 309.

**ARCH 441, 442, 443 Professional Practice (2) (2) (2)**

Basic elements of architectural practice. Office organization, procedures, contracts, specifications, construction cost analyses and comprehensive client services. Professional ethics. 2 activities. Prerequisite: ARCH 343 and fourth-year standing.

**ARCH 446 The Small Scale Master Builder (3)**

Principles of practice as owner-designer-builder, selling or leasing products. Comparison with traditional practice. Potential income, constraints on design decisions, and ethics. Analysis of factors and methods relevant to such practice, including financing, taxes, accounting, market analysis, and development potential. Starting with little or no capital. 3 lectures. Prerequisite: Fourth-year standing.

**ARCH 451 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 452 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects in an urban context. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 453 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects in an urban context. 5 laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 458 Computer Graphics Applications in Architecture (2)**

Computer graphics techniques as they relate to applications in working drawings and design. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 459 Advanced Computer Applications (2)**

Application computer programming in advanced areas of architectural applications with emphasis in integrated data processing techniques, office automation, computer aided design, graphics and office communication as pertaining to architectural practice. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 463 Undergraduate Seminar (2) (CR/NC)**

Discussion and lectures on problems of practice in architecture. Professional ethics. Students present organized material on some subject of interest in architecture. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

**ARCH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ARCH 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.



**ARCH 481 Architectural Design (5)**

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with not more than 5 units in any one quarter. Miscellaneous course fee required—see Class Schedule. 5 laboratories. Prerequisite: ARCH 441, ARCH 442, ARCH 443, ARCH 451, ARCH 452, ARCH 453.

**ARCH 491, 492, 493 Design Project (2) (2) (2)**

A comprehensive architectural design project chosen by the student to challenge technical, creative, and organizational abilities. Project to involve community or field contact on a team basis. Construction or projects involving other disciplines encouraged. 2 laboratories. Prerequisite: Fifth-year standing.

**ARCH 501 Environmental Control Systems (3)**

Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 510, 511 Environmental Design Methods (3) (3)**

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 513 Natural Architectural Lighting (3)**

Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 514 Artificial Architectural Lighting (3)**

Perception and awareness of light; artificial light as a design tool; the characteristics of artificial light sources; the use of artificial light to reinforce the architectural concept. Principles of design in lighting fundamentals and techniques. Independent project required. Architectural aesthetics stressed. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 531 Habitability (3)**

Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 532 Environmental Research and Development (3)**

Roles of research in environmental design analysis. Approaches to research, hypothesis testing, data banks, and information systems for design. Use of research findings in various decision-making systems. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 533 Architectural Programming (3)**

Information management in the design process. Techniques for gathering, analyzing, and transforming data for use as design information. A variety of approaches to pre-design planning. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 551 Architectural Design (5)**

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories. Prerequisite: Graduate standing.

**ARCH 561, 562 Advanced Design (6) (3)**

Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. 561, 6 laboratories; 562, 3 laboratories.

**ARCH 563 Professional Seminar (2)**

Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 seminars. Prerequisite: Graduate standing and consent of instructor.

**ARCH 580 Seminar in Theory of Architecture (3)**

Directed group study of selected topics in the theory of architecture for graduate students. Class schedule will list specific topics selected. May be repeated to 9 units. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 598 Master's Design Project (3-6)**

Completion of an architectural design project demonstrating individual creative ability at an advanced level. 3 or 6 laboratories. Prerequisite: Consent of graduate adviser, consent of graduate committee, and ARCH 561.

**ARCH 599 Master's Thesis (3-6)**

Completion of a thesis embodying original research in an area of environmental design. Prerequisite: Consent of graduate adviser, consent of graduate committee and ARCH 561.

## ART

**ART 101 Fundamentals of Drawing (3)**

Analysis and practice in functional drawing, basic design, and study of form. Development of individual techniques. 3 activities.

**ART 104 Introduction to Art Materials (3) (Also listed as ED 104)**

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

**ART 111 Introduction to Art (4)**

GEB C.2.

Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture, and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures.

**ART 112 Survey of Art History (3)**

GEB C.2.

Major forms of art expression from some ancient civilizations through French influence. Includes art of ancient Egypt, Greece, Italy, Medieval Europe, Italian Renaissance, Baroque Italy and France, terminating with Romanticism and Realism in France. 3 lectures.

**ART 131, 132, 133 Design Fundamentals (3) (3) (3)**

Sequential development of basic design theory and practice in two dimensions and color. 1 lecture, 2 activities.

**ART 134 3-Dimensional Design (3)**

Research of form and material as it pertains to application of three-dimensional design concepts. Miscellaneous course fee required—see Class Schedule.

1 lecture, 2 laboratories. Prerequisite: ART 131, ART 132, ART 133 or consent of instructor.

**ART 141 Introduction to 3-Dimensional Materials (3)**

Exploration of materials including clay, metal, and wood with specific emphasis on design problem solving and execution. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

**ART 145 Ceramics Handbuilding (3)**

Handbuilding techniques, including slab, coil, pinch, press and other forms. Emphasis on skill development and personal creative statement. Miscellaneous course fee required—see Class Schedule. 3 activities.

**ART 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**ART 201 Intermediate Drawing (3)**

Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite: ART 101.

**ART 204 Beginning Watercolor (3)**

Transparent watercolor painting. Course emphases: proper use of watercolor paper, brush techniques, pigment mixing, use of color, use of washes, wet-into-wet, indirect methods, composition and presentation. 3 activities. Prerequisite: ART 101.

**ART 208 Sculpture (3)**

Elements of three-dimensional form through the exploration of sculptural techniques. Problems in modeling, casting, carving and techniques of assembly. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

**ART 211 Art History—Prehistoric through the Middle Ages (4)**

Outstanding art of ancient cultures in Europe and the Eastern Mediterranean. Emphasis upon painting, sculpture, and related visual arts as reflected through historical background factors. 4 lectures.

**ART 212 Art History—Renaissance through the Baroque Era (4)**

Significant visual expressions in Europe from the Renaissance, Baroque and post-Baroque eras. Emphasis upon the study of painting, sculpture, and related visual arts as influenced by religion, philosophy, and other background factors. Unique contributions of major artists from these epochs also studied. 4 lectures.

**ART 213 Art History—European 18th and 19th Century Art (4)**

Painting, sculpture and the related visual arts culminating with Romanticism, Neoclassicism, and Realism. Historical factors and artistic leaders pertinent to art expression of these epochs emphasized. 4 lectures.

**ART 221 Basic B/W Photography (3)**

Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality continuous tone print, and print presentation. 2 lectures, 1 laboratory.

**ART 222 35mm Intermediate Photography (3)**

Control of tonal range using 35mm cameras and available daylight illumination. Composition and visual communication. Assignments range from close-ups to architecture. Emphasis on professional quality enlargements. 2 lectures, 1 laboratory. Prerequisite: ART 221.

## 300 ART

### ART 224 35mm Advanced B/W Photography (3)

Advanced B/W photography using 35mm cameras. Artificial light including studio electronic flash, tungsten studio light, and hand strobe. Professional quality developing and printing. Includes portraiture, close-ups, product, and action. 2 lectures, 1 laboratory. Prerequisite: ART 221.

### ART 228 35mm Color Slide Photography (2)

Introductory nonlaboratory course in color slide photography featuring 35mm camera handling, slide film, indoor and outdoor photography, composition, slide presentation. 2 lectures.

### ART 242 Glassforming (3)

Techniques in the offhand process of working with glass from a furnace. Overview of glass history. Development of tools and forming processes studied while students develop 3-dimensional projects. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity.

### ART 245 Ceramics (3)

Ceramic processes with emphasis on design quality, hand building, and use of the potter's wheel. Sketchbook required. Awareness of design as it applies to production of single and multiple objects. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

### ART 250 Wood Design (3)

Development of quality design in wood. Use of basic hand tools and processes. Design and completion of projects using fine hardwood. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

### ART 255 Jewelry Design (3)

Nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on design and craftsmanship. Awareness of production of single and multiple objects. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

### ART 301 Advanced Drawing (3)

Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: ART 131 and ART 201.

### ART 302, 303 Life Drawing (3) (3)

Advanced problems in life drawing. Development of advanced methods and techniques in the study of form and structure as it relates to proportion, anatomy analysis and composition. 3 activities. Prerequisite: ART 201.

### ART 304 Advanced Watercolor (3)

Transparent watercolor painting. Design and composition of painting, use of drawing and advanced watercolor techniques. 3 activities. Prerequisite: ART 204.

### ART 305 Painting Techniques (3)

Physical characteristics of painting media, creative understanding of pictorial space and color: 3 activities. Prerequisite: ART 101, or consent of instructor.

### ART 308 Sculpture (3)

Exploration of three-dimensional form through sculptural techniques. Advanced problems in modeling, casting, carving, and techniques of assembly. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 208 or consent of instructor.

**ART 309 Illustration (3)**

Development of drawing skills necessary for the rendering of editorial and advertising illustration. Brief historical survey of illustration, research, and conceptual development of illustration. 3 activities. Prerequisite: ART 201 and ART 301 or consent of instructor.

**ART 311 Art History—Modern Art (4)**

Major art movements, innovations and ideologies of major artists from Impressionism to the Contemporary Era. 4 lectures. Prerequisite: ART 111 or ART 213.

**ART 312 Art History—Contemporary Art (3)**

Art from World War I to the present with an emphasis on the last 40 years. Avant-garde art philosophies, artworks of the machine and "Future Shock" age and new media for expressions are examined. 3 lectures. Prerequisite: ART 111 or 200-level art history course or consent of instructor.

**ART 314 History of Photography: Images and Processes (4)**

GEB C.3.

Photography and significant photographers from the invention of the camera obscura to the present day. Development of the technology of photography in relationship to the images produced. Relationship of photography to other visual arts as well as its social and cultural impact. 4 lectures.

**ART 315 Design History I (3)**

Evolution in western civilization from handcraft production to industrialization from beginnings of modern times through the 19th century. Design and origins of styles interpreted relative to social, economic, and technological factors. 3 lectures. Prerequisite: ART 211 and ART 212 or ART 213 (for Art majors); junior standing for all other students.

**ART 316 Design History II (3)**

Continuation of ART 315, surveying design history from early 1900 (Art Deco) to the present. Emphasis placed on Constructivism, Streamlining, and development of the Modern Movement in design. 3 lectures. Prerequisite: ART 211 and ART 212 or ART 213 (for Art majors); junior standing for all other students.

**ART 322 Color Photography I, Negative (3)**

Fundamental techniques in color photography. Theory of color, exposing, and processing color negatives, printing from color negatives, finishing and presentation. Studio electronic flash and available light. 2 lectures, 1 laboratory. Prerequisite: ART 224.

**ART 323 Color Photography II, Positive (3)**

Applied techniques in exposing and processing 35mm color transparencies; color printing from color slides; finishing and presentation. Emphasis on analyzing color slides to produce quality color prints. 2 lectures, 1 laboratory. Prerequisite: ART 224 and ART 228.

**ART 325 4x5 Camera Techniques, B/W (3)**

Basic techniques using 4x5 view cameras. Architecture, landscapes, portraiture, and other outdoor subjects used to help the student master the use of large format cameras. Other topics include exposure techniques, perspective, and sharpness correction, lighting and composition. Sensitometric approach to B/W film development and print quality stressed. 2 lectures, 1 laboratory. Prerequisite: ART 221 and ART 224.

**ART 326 4x5 Camera/Commercial (3)**

Professional techniques with large format cameras. Outdoor and studio photography presented using B/W film and color transparencies. Topics include studio lighting for glass and metal, copying, interiors, and product photography. 2 lectures, 1 laboratory. Prerequisite: ART 322, ART 323, ART 325.

**ART 327 Portraiture I, B/W (3)**

Studio and environmental portraiture. Emphasis on light ratios/patterns; posing; personality portrayal. Retouching of film and print. Small format cameras. 2 lectures, 1 laboratory. Prerequisite: ART 224.

## 302 ART

### ART 331, 332, 333 Graphic Design (3) (3) (3)

Investigation and experimentation in typography, symbology, and design. Emphasis on lettering skills, visual problem solving and development of corporate identity systems. 3 activities. Prerequisite: ART 309 or consent of instructor.

### ART 341 Multiple Processes in Crafts (4)

Production methods for studio or industrial craftmakers with consideration to design integrity, material use and product acceptance. Each schedule listing will have an area and topic subtitle. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 activities. Prerequisite: ART 300-level in same area or consent of instructor.

### ART 342 Glassforming (3)

Techniques in the processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities.

### ART 343 Glassforming (3)

Selected advanced topics in glassforming with emphasis placed on development of the student's individual design concepts and vocabulary. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: ART 242 and ART 342 or consent of instructor.

### ART 345 Ceramic Form Design (3)

Development of hand, wheel, mold, jigger, and press forming skills. Awareness of design as it applies to single and multiple objects. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 245 or consent of instructor.

### ART 346 Ceramic Surface Design (3)

Systematic use of clay, slip, engobe, glaze and firing processes. Contemporary craftmaker's skills are developed through study of historic and industrial techniques. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 245 or consent of instructor.

### ART 349 Ceramic Glazes (3)

Historical background, chemistry review, raw materials, colorants, glaze calculations, construction of test tiles, techniques of glaze application and firing. Emphasis on notebooks; written and oral presentation of final project. Total credit limited to 6 units. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: CHEM 106 and ART 346 or consent of instructor.

### ART 355 Metalsmithing (3)

Investigation of surface design techniques for nonferrous metals including etching, chasing-repoussé, mokume, inlay, and various texturing processes. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 255 or consent of instructor.

### ART 356 Jewelry Casting (3)

Introduction to casting for the jeweler with emphasis on lost wax techniques including design, wax working, casting and finishing. Awareness of design as it applies to single and multiple objects. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 255 or consent of instructor.

### ART 357 Metalsmithing (3)

Advanced design concepts applied to metalsmithing. Exploration of techniques used in creating holloware forms with emphasis on raising. Awareness of design as it applies to the production of single and multiple objects. Quality design concepts expected. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 355 and ART 356 or consent of instructor.

**ART 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

**ART 422 Creative B/W Photography (4)**

Based upon black and white advanced techniques. High contrast, Sabbatier, bas-relief, tone line, texture screens, other abstract techniques. Emphasis placed on creative self-expression, application of techniques to give greater visual impact. 2 lectures, 2 laboratories. Prerequisite: ART 224.

**ART 424 Multi-Media/Color Photography (4)**

Multi-media presentation, synchronizing color slides, music and narration. Contemporary, creative photography techniques applied. Creative seeing, self-expression and interpretation that communicates to the viewer. 2 lectures, 2 laboratories. Prerequisite: ART 323 or consent of instructor.

**ART 426 Illustration Photography I, B/W (3)**

Principles of lighting and design as applied to subjects and small product studio photography. 35mm and 2¼ cameras used. Emphasis on creative problem solving, constructing scene and lighting to produce quality image. 2 lectures, 1 laboratory. Prerequisite: ART 224, ART 422.

**ART 427 Illustration Photography II, Color (3)**

Applied principles of design and color to produce a photograph that sells an idea, product, or service. 35 mm and 2¼ cameras used. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 322, ART 323, ART 426.

**ART 431, 432, 433 Advanced Graphic Design (3) (3) (3)**

Advanced problems in advertising, layout, and package design. Awareness of designer/client relationships within the different design professions. 3 activities. Prerequisite: ART 333 or consent of instructor.

**ART 445 Advanced Ceramics (3)**

Clay-working processes with controlled forms and surfaces. Development of personal design philosophies as a basis for form and statement criticism. Drawing, forming and firing techniques emphasized. Awareness of design as it applies to projection of single and multiple objects. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 345 and ART 346 or consent of instructor.

**ART 446 Advanced Ceramics (3)**

Surface development on pottery or sculpture. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: ART 346 or consent of instructor.

**ART 460 Professional Practices (2)**

Professional practices in the art and design field, legal and ethical questions, taxes, contracts, fees and copyrights. Current job opportunities, resumé and portfolio preparation with visiting professionals. 2 activities. Prerequisite: Advanced standing in major or consent of instructor.

**ART 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Minimum of 120 hours time. Results presented in a formal report. Prerequisite: Senior standing and ART 460.

**ART 463 Undergraduate Seminar (2)**

Analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: Senior standing.

## 304 ASCI

### ART 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### ART 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### ART 482 Crafts Design/Production (5)

Design development and production of a series or edition of craft objects, after analysis of crafts history, aesthetics, function, materials, processes and costs. Miscellaneous course fee required—see Class Schedule. 5 activities. Prerequisite: Senior standing and consent of instructor.

## ASCI—ANIMAL SCIENCE

### ASCI 111 Market Beef Production (3)

Breeds, market classes, and grades of beef cattle. Selection of feeder cattle. Management practices in purchasing and fattening cattle using farm grown feeds. Study of cattle feeding operations carried on at the campus. Marketing of beef cattle. 3 lectures.

### ASCI 112 Elements of Swine Production (3)

History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practices of swine feeding and management. 3 lectures.

### ASCI 113 Elements of Sheep Production (3)

Survey of the types of sheep operations in California. Breed study, market classes, and grades identification. Commercial fattening of lambs in dry lot and irrigated pasture programs. Calendar of operations for the various types of sheep enterprises. 3 lectures.

### ASCI 114 Elements of Horse Production (3)

Status of the horse industry. Breeds of horses and their uses. Anatomy and parts of the horse. Unsoundnesses, ailments and their treatments. Early history of the horse. 3 lectures. Concurrent enrollment in ASCI 244 recommended.

### ASCI 131 Basic Equitation (3)

Grooming, saddling, bridling, mounting, seat and hands. Horsemanship both under saddle and bareback. Basic care of the horse. Study of types of horse gear and equipment. Designed to teach basic riding to students with no previous experience. Advanced sign-up with instructor required. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

### ASCI 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### ASCI 202 Feeds and Feeding (3)

GEB F.2.

Simple use of food nutrients. Identification and classification of feeds for each class of livestock. Digestion and utilization of feeds. Feeding standards and computation of simple rations for livestock. Economy in feeding and purchasing feeds by nutritive values. 3 lectures. Concurrent enrollment in ASCI 240 recommended.

### ASCI 226 Livestock Evaluation (3)

Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.



**ASCI 229 Range Management (4)**

Characteristics of rangeland, identification of range plants, management practices to maintain range resources and increase production of forage and livestock. 3 lectures, 1 laboratory. Prerequisite: SS 121, ASCI 111 or ASCI 230, a botany or crops science course.

**ASCI 230 General Animal Science (4)**

GEB F.2.

Role of animal agriculture in food production and human nutrition. Discussion of breeds, types of enterprises, nutrition, reproduction and management of beef cattle, sheep and swine. Commentary on the horse as a recreational animal. Credit not allowed for animal science majors. 3 lectures, 1 laboratory.

**ASCI 234 Horseshoeing (2)**

Fundamentals of horseshoeing, anatomy and physiology of the horse's foot, pastern, and legs. Trimming feet, fitting and nailing shoes. Normal shoeing, corrective shoeing. 1 lecture, 1 laboratory combined.

**ASCI 240 Applied Feeds and Feeding (2)**

Introduction to feedstuffs, identification and quality evaluations. Proximate analysis, digestibility and energy values of feeds. Mechanics of ration formulation and feeds selection based on nutrient content and market values for the various species of domestic livestock. 1 lecture, 1 activity. Prerequisite or corequisite: ASCI 202 recommended.

**ASCI 241 Applied Beef Cattle Practices (2)**

Application of operational practices in the purchasing, management, and marketing of beef cattle. Equipment, preventive veterinary practices, live animal evaluation, performance records, carcass evaluation, and ranch evaluation. 1 lecture, 1 activity.

**ASCI 242 Applied Swine Management Practices (2)**

Application of operational practices in the management and merchandising of swine. Housing and equipment, routine veterinary practices, live animal evaluation, performance evaluations, farrowing and post-farrowing practices, and carcass appraisal. 1 lecture, 1 activity.

**ASCI 243 Applied Sheep Management Practices (2)**

Flock management; sheep handling techniques; breed evaluation; preparation for exhibition; internal and external parasite control; tagging, shearing, foot trimming; selection; culling and identification. Marking techniques. Wool grading and judging. Market lamb and carcass evaluation. 1 lecture, 1 activity.

**ASCI 244 Applied Horse Practices (2)**

History and location of horse unit facilities and breeds maintained. Common knots, proper techniques in safely catching, leading, grooming, and restraining horses. Evaluation of desirable and faulty conformation. Preventive health program. Determining the age of a horse by dentition. Pedigree analysis. 1 lecture, 1 activity. Prerequisite or corequisite: ASCI 114 recommended.

**ASCI 302 Applied Animal Nutrition (3)**

Feedstuff evaluation and analysis. Advancements in feedstuff evaluation and application to ration formulation. Principles and practices in livestock ration formulation. Linear programming principles as applied to computer formulated rations. 2 lectures, 1 laboratory. Prerequisite: ASCI 202, CHEM 326.

**ASCI 304 Animal Breeding (3)**

Application of genetics to the improvement of farm animals. Improving production through a study of mating systems including outbreeding, inbreeding, selection techniques, performance testing and evaluating, herd records, indexing and progeny testing. Setting up and organizing improved breeding programs using modern technique and equipment. 3 lectures. Prerequisite: BIO 303.

## 306 ASCI

### ASCI 311 Commercial Beef Management (3)

Care and management of a breeding herd of commercial cattle in California. Range and farm lands suited to beef production. Factors affecting cost of production. Improvement of breeding herd. Trends in the industry. 3 lectures. Prerequisite: ASCI 111, ASCI 202.

### ASCI 312 Swine Management (3)

Management practices involved in commercial and purebred swine enterprises. Methods of production and marketing, performance testing programs and carcass evaluation techniques. Nutritional requirements, rations, diseases and parasites, facilities and equipment. 3 lectures. Prerequisite: ASCI 112, ASCI 202.

### ASCI 313 Sheep Management (3)

Managerial practices for both commercial and purebred sheep enterprises. Performance testing and carcass evaluation techniques. Preparation and merchandising of the wool clip. Introduction to wool processing. 3 lectures. Prerequisite: ASCI 113, ASCI 202.

### ASCI 323 Beef Husbandry (4)

Purebred cattle business including selection of foundation stock, herd bulls; breeding programs; pedigrees; facilities and equipment; feeding breeding herd, sale cattle, show cattle; marketing purebred cattle; and general management problems. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: ASCI 202.

### ASCI 326 Advanced Livestock Evaluation (2)

Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. 2 laboratories. Prerequisite: ASCI 226.

### ASCI 332 Range Technology (4)

Fundamentals of rangeland survey and inventory. Application of ecology in range evaluation. Analysis of range condition and capacity. Development of plans for effective improvement and utilization of rangeland. 3 lectures, 1 laboratory. Prerequisite: ASCI 229.

### ASCI 333 Horse Husbandry (4)

Management of the breeding farm. Farm layout. Inheritance, pedigrees, diseases, breeding problems, nutrition, study of estrous cycles, and servicing the mare. Handling stallions. Sale preparation. Breeding and feeding records, office procedure, selection of breeding stock. 3 lectures, 1 laboratory. Prerequisite: ASCI 114, ASCI 244.

### ASCI 334 Feed Mill Operation (4)

General operation of a feed mill including a survey of the industry, buying, storing, grinding, weighing, mixing, packaging, handling, and delivery of formula feeds. Flow of materials, preventive maintenance and safety in a mill. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory. Prerequisite: ASCI 202, ASCI 240.

### ASCI 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Prior consent of department head.

### ASCI 401 Reproductive Physiology (4)

Reproductive efficiency of farm animals. Anatomy and physiological factors involved in reproduction. Male and female systems, pregnancy, estrual behavior, semen collection and evaluation, artificial insemination, pregnancy testing, and hormone therapy. 3 lectures, 1 laboratory. Prerequisite: VS 123.

### ASCI 402 Animal Nutrition (4)

Metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures, 1 laboratory. Prerequisite: ASCI 302, CHEM 328.

**ASCI 404 Applied Animal Genetics (3)**

Genetic improvement of economic traits in farm animals. Application of advanced genetic concepts to animal improvements through analysis of performance data. 2 lectures, 1 laboratory. Prerequisite: ASCI 304.

**ASCI 434, 435 Specialized Horse Enterprises (3) (3)**

Early schooling of the young horse through advanced training. Use of the snaffle bit, hackamore, half-breed and Spanish bits. Gentling and ground work. Training in collection, turning, backing, leads, trailer loading, rope work, cattle work. Advanced sign-up with instructor required. 1 lecture, 2 laboratories. Prerequisite: ASCI 333 or appropriate experience.

**ASCI 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**ASCI 463 Undergraduate Seminar (2)**

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field. 2 seminars.

**ASCI 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ASCI 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ASCI 581 Graduate Seminar in Animal Production (3)**

Current findings and research problems in the field and their application to the industry. 3 seminars.

## ASTR—ASTRONOMY AND ASTROPHYSICS

**ASTR 101 Introduction to the Solar System (3)**

GEB B.1.a.

Descriptive astronomical properties of the earth, moon, other planets and their satellites. Comets, asteroids and other members of the solar system. Theories of the formation of the solar system. Opportunities for telescope observations of the moon and planets. Not open to students who have completed or are taking ASTR 301, or PHYS 132. 3 lectures.

**ASTR 102 Introduction to Stars and Galaxies (3)**

GEB B.1.a.

Descriptive astronomical properties of the sun, stars, galaxies, and interstellar material. The expanding universe and cosmological models. Opportunities for telescope observations and star identification. Not open to students who have completed or are taking ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures.

**ASTR 301 The Solar System (3)**

Quantitative and descriptive properties of the solar system including the physics of the planets, their satellites, comets and interplanetary media; possible origins of the solar system. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. Not open to students who have completed ASTR 101.

**ASTR 302 Stars and Galaxies (3)**

Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. ASTR 301 is not a prerequisite. Not open to students who have completed ASTR 102.

## 308 BACT

### ASTR 303 Cosmology and General Relativity (3)

Introduction to the basic ideas of general relativity. Einstein's law of gravity, curved space and its application to relativistic models of the universe, black holes, and pulsars. Big Bang and Steady State theories of the expanding universe. Relevant observational evidence included. 3 lectures. ASTR 302 is not a prerequisite. Prerequisite: PHYS 133.

## BACT—BACTERIOLOGY

### BACT 221 General Bacteriology (4)

GEB B.1.b.

Morphology, metabolism, classification and identification; bacteriology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. 2 lectures, 2 laboratories. Prerequisite: One quarter of chemistry.

### BACT 224 General Microbiology I (4)

Functional anatomy and physiology of prokaryotic and eukaryotic microorganisms. 2 lectures, 2 laboratories. Prerequisite: BOT 121 or ZOO 131 and organic chemistry (or equivalent).

### BACT 225 General Microbiology II (4)

Systematics, genetics, and ecology of microorganisms with emphasis on procaryots; a survey of the microbial groups. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

### BACT 322 Dairy Bacteriology (4)

GEB B.1.b.

Advanced course for practical work demonstrating the domestic and industrial importance of microorganisms involved in milk and dairy products; milk, milk powders, fermented milks, evaporated and condensed milks, butter, cheese, cheese starters, and ice cream. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

### BACT 333 Industrial Microbiology (4)

GEB B.1.b.

Industrial application of microorganisms in the production of chemicals related to the food and pharmaceutical industries; consideration of environmental sanitation in industrial processes. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, CHEM 326.

### BACT 342 Sanitary Microbiology (4)

GEB B.1.b.

Principles of disease prevention and control. Water-, food-, and air-borne microbial contamination and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

### BACT 402 General Virology (3)

Virus-host interactions. Structure and function of viruses as obligate intracellular parasites of microbes, plants, and animals. Epidemiology, pathogenesis, prophylaxis, chemotherapy, and manipulation of viruses which parasitize man. 3 lectures. Prerequisite: BACT 224. Recommended: One quarter of college biochemistry.

### BACT 403 General Virology Laboratory (2)

Methods of culture, characterization and identification of viruses, with emphasis on viruses parasitic in man and animals. 2 laboratories. Prerequisite or concurrent: BACT 402 and consent of instructor.

### BACT 421 Food Microbiology (4)

Physiological activities of microorganisms involved in the preparation, preservation, deterioration and toxicity of foods and related products. Sanitary and public health implications. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224. Recommended: CHEM 326.

### BACT 423 Medical Microbiology (4)

Microorganisms as agents of disease in man. Epidemiology, host-parasite relationships, and principles and procedures for laboratory diagnosis of human diseases. 2 lectures, 2 laboratories. Prerequisite: BACT 225. Recommended: ZOO 426.

**BACT 424 Bacterial Cytology and Physiology (4)**

Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological implications. 3 lectures, 1 laboratory. Prerequisite: BACT 225 and CHEM 326. Recommended: One quarter of biochemistry.

**BACT 430 Medical Mycology (4)**

Morphology, physiology, infectivity, and immunogenicity of fungi pathogenic for man and other mammals. Host-parasite interactions. Demonstration and isolation of pathogenic fungi from clinical material. 2 lectures, 2 laboratories. Prerequisite: BACT 423.

**BACT 436 Microbial Ecology (4)**

Distribution and interrelationships of marine, fresh water, and terrestrial protists. Microorganisms as biological, biochemical, and geological agents and the role they play in the cycles of nature. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

## BIO—BIOLOGY

**BIO 099 Agricultural Biology (3)**

Basic biological principles applied to agriculture. This course may not be substituted for General Zoology or General Botany. 3 lectures. Not open to degree students for degree credit.

**BIO 100 Orientation to Biological Sciences (1) (CR/NC)**

Career opportunities in the biological sciences, designing a career goal and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture.

**BIO 101 General Biology (3)**

GEB B.1.b.

Principles of cellular biology, heredity, ecology, and evolution, with emphasis on their relationship to human affairs. Not open to students who have completed BOT 121 or ZOO 131. 3 lectures.

**BIO 102 Plant Biology (3)**

GEB B.1.b.

Structural and functional aspects of plants, with emphasis on seed producers. Not open to students who have completed BOT 121. 3 lectures. Prerequisite: BIO 101.

**BIO 103 Animal Biology (3)**

GEB B.1.b.

Structural and functional aspects of animals, with emphasis on man. Not open to students who have completed ZOO 131. 3 lectures. Prerequisite: BIO 101.

**BIO 105 General Biology Laboratory (1)**

GEB B.1.b.

Observations and experiences involving basic principles in the biological sciences. Emphasis on the diversity of living systems; cell structure and function; interaction of the environment with populations and communities; natural selection and evolution. 1 laboratory. Concurrent or previous enrollment in BIO 101.

**BIO 127 Natural History: Animal Adaptations (3)**

GEB B.1.b.

Interpretation of structural and functional adaptations of animals; emphasis on phenomena readily observed in the field. Laboratory exercises emphasize insects as examples. 2 lectures, 1 laboratory.

**BIO 128 Natural History: Animal Communities (3)**

GEB B.1.b.

Examination of local biotic communities, emphasizing identification and natural history of the animals which inhabit them. Field experience in local communities. 2 lectures, 1 laboratory, 2 Saturday field trips. Recommended: BIO 127.

**BIO 129 Natural History: Plant Communities (3)**

GEB B.1.b.

Principles of field biology and ecology; laboratory and field study of land and freshwater plant communities, emphasizing identification of plants inhabiting them. 1 lecture, 2 laboratories, Saturday field trips. Recommended: BIO 128.

**BIO 220 Physiology and Biological Adaptation (4)**

GEB B.1.b. and E.2.

Physiological principles with integration of principles of adaptation of life processes among living organisms. 4 lectures. Prerequisite: Completion or simultaneous enrollment in college level chemistry.

**BIO 253 Orientation to the Health Professions (1) (CR/NC)**

Participation in hospital activities and mental health services. Intended for medically oriented students. Total credit limited to 6 units with a maximum of 1 unit per quarter. Offered only on Credit-No Credit basis. 1 activity. Prerequisite: Instructor's consent and one quarter of college chemistry and ZOO 131.

**BIO 255 Microtechnique (2)**

Methods of preparing plant and animal tissues for microscopic study with emphasis on paraffin embedding techniques and staining. 2 laboratories. Prerequisite: BOT 122 or ZOO 132.

**BIO 300 Biology of Cancer (2)**

Molecular, cellular and immunological aspects of cancer. Types of cancer and modes of treatment. Environmental, psychological and sociological implications. Cancer research. Not for Biology credit for majors in Biological Sciences. 2 lectures.

**BIO 301 Human Ecology (3)**

GEB B.1.b.

Examination of the ways in which man is dependent on his environment, his ability to modify it, and the results of such modification. 3 lectures. Prerequisite: One quarter of biological science.

**BIO 302 Human Inheritance (3)**

GEB B.1.b.

Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomalies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic counseling. 3 lectures. Prerequisite: One course in college biology (preferably BIO 101 or ZOO 131).

**BIO 303 Genetics (3)**

GEB B.1.b.

Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics.

**BIO 304 Molecular Genetics (3)**

Introduction to the structures, functions, and regulatory mechanisms of nucleic acids in biological systems. 3 lectures. Prerequisite: One quarter of college biology. Recommended: BIO 303 and one course in biochemistry.

**BIO 311 Radiation Biology (3)**

GEB B.1.b.

Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 122 or CHEM 128 and one of the following: BIO 101, BOT 121, ZOO 131.

**BIO 312 Introduction to Scanning Electron Microscopy (2)**

Structure, functioning and techniques of applying SEM to the study of biological and nonbiological materials. 1 lecture, 1 activity.

**BIO 315 Evolution (3)**

Modern concepts of evolutionary mechanisms. 3 lectures. Prerequisite: BIO 303.

**BIO 321 Biological Instrumentation (3)**

Theory and operation of instruments commonly used in biological investigation. 1 lecture, 2 laboratories. Prerequisite: BOT 121 or ZOO 131.

**BIO 325 General Ecology (3)**

GEB B.1.b.

Interrelationships between plants and animals and their environment in terrestrial, marine, and freshwater situations. 2 lectures, 1 laboratory. Prerequisite: BIO 129 or both BOT 122 and ZOO 132.

**BIO 328 Marine Biology (4)**

Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 2 laboratories. Prerequisite: BOT 122 and ZOO 133, or consent of instructor.

**BIO 334 Freshwater Ecology (3)**

Physical, chemical, and biological factors of freshwater environments as they relate to freshwater organisms. 2 lectures, 1 laboratory. Prerequisite: One year college biology, one quarter college chemistry.

**BIO 342 Computer Applications in Biology (3)**

Application, use and simple modification of computer programs for biological studies. 2 lectures, 1 laboratory. Prerequisite: Junior standing, completion of mathematics requirement, and CSC 101 or CSC 110.

**BIO 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**BIO 415 Biogeography (3)**

Plant and animal distribution patterns in relation to past and present physical and biotic factors; continent by continent survey of biogeography with major emphasis on North America. 3 lectures. Prerequisite: BIO 325.

**BIO 423 General Cytology (4)**

Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: ZOO 131 and BOT 121 and organic chemistry or biochemistry.

**BIO 424 Organizing and Teaching Biological Sciences (3)**

Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Evidence of satisfactory preparation in biology, botany, and zoology.

**BIO 425 Basic Electron Microscopy I (3)**

Biological applications of electron microscopy including techniques of specimen preparation, design of experiments, interpretation of results and limitations. 1 lecture, 2 laboratories. Prerequisite: ZOO 131, BOT 121, BIO 423 or consent of instructor.

**BIO 426 Cytogenetics (4)**

Cytological basis of genetics. Correlation between genetic principles and chromosome behavior by studying mitotic and meiotic cells. Cytological study of hybrids, polypoids and chromosomal aberrations in plants and animals. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

**BIO 431 Physiology I: General (4)**

Functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: CHEM 326; BOT 122 or ZOO 132.

**BIO 437 Marine Resources (3)**

Resource status of present and potential biological marine resources of the sea. Identification, life history, ecology, culture and economics of pertinent organisms. 3 lectures. Prerequisite: BOT 122 and ZOO 133.

**BIO 442 Biometry (4)**

Design of biological experiments with emphasis on sampling methods, data collection, mensuration, and analysis of field and laboratory data. 3 lectures, 1 laboratory. Prerequisite: One year of biology and STAT 212 or STAT 321.

**BIO 461, 462 Senior Project (3) (2)**

Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in written reports. Minimum 150 hours total time.

**BIO 463 Undergraduate Seminar (2)**

Study and discussion of recent developments in the field of biology. 2 seminars. Prerequisite: Senior standing.

**BIO 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**BIO 471 Selected Advanced Laboratory (1-2)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 4 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

**BIO 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

**BIO 515 History of Biology (3)**

Critical survey of the historical development of experimental designs for the solution of biological problems. 3 seminars. Prerequisite: Graduate standing.

**BIO 524 Developmental Biology (3)**

Developmental phenomena of higher and lower plants, vertebrate and invertebrate animals at the molecular, cellular, histological and organ levels. Each quarter will emphasize a different biological description. 3 units per quarter. May be repeated to a maximum of 9 units. 2 seminars, 1 laboratory. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.

**BIO 527 Cell Physiology (3)**

Cellular metabolism and regulation. Current theories on cellular differentiation and transformation. 3 seminars. Prerequisite: Graduate standing and CHEM 328, BIO 423, BIO 431 and consent of instructor.

**BIO 542 Multivariate Biometry (4)**

Design of biological experiments involving multivariate observations. Experimental design, sampling, computer analysis, and interpretation of results. 3 lectures, 1 laboratory. Prerequisite: STAT 313, BIO 442.

**BIO 543 Morphometrics (3)**

Biological phenomena from problem definition and field collection of data through multivariate analysis of data and presentation of results. 2 seminars, 1 laboratory, 2-4 weekend field trips. Prerequisite: BIO 542.

**BIO 570 Selected Topics in Biology (1-3)**

Directed group study of selected topics for graduate students. Class schedule will list topics for selection. Topic credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.



**BIO 590 Seminar in Biology (1)**

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Maximum of 5 units. 1 seminar. Prerequisite: Graduate standing and evidence of satisfactory preparation in biological sciences.

**BIO 599 Thesis (3) (3) (3)**

Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing and consent of instructor.

**BOT—BOTANY****BOT 121 General Botany (4)**

GEB B.1.b.

Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

**BOT 122 General Botany (4)**

GEB B.1.b.

Structure and relationships of plant groups from bacteria to angiosperms, emphasis on nonseedbearing plants of economic importance. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 123 Introductory Plant Taxonomy (4)**

GEB B.1.b.

Introduction to classification and identification of vascular plants, emphasizing the families of major economic importance; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 238 Native Plant Materials (3)**

Identification, habits of growth, cultural requirements and landscape use of native California plants suitable for landscape purposes. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: BOT 121 or consent of instructor.

**BOT 322 Introductory Plant Physiology (4)**

GEB B.1.b.

Consideration of the principal physiological processes of plants including water relations, mineral nutrition, photosynthesis, respiration, and growth of the plant. 3 lectures, 1 laboratory. Prerequisite: BOT 121 and CHEM 326.

**BOT 323 Plant Pathology (4)**

GEB B.1.b.

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: BOT 122 or BOT 123.

**BOT 324 Ornamental and Forest Pathology (4)**

GEB B.1.b.

Causes and effects of diseases of important ornamental and forest plants, disease agents (life cycle, host range, environmental relationships), and modern approach to control. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 325 Plant Nematology (4)**

Plant parasitic nematodes, their morphology, classification, and the damage they cause plants, alone or in combination with other pathogens. 2 lectures, 2 laboratories. Prerequisite: BOT 323, ENT 326.

**BOT 326 Plant Ecology (4)**

GEB B.1.b.

Effects on plant growth and development of the following environmental factors: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: BOT 123.

**BOT 333 Field Botany (4)**

GEB B.1.b.

Field identification of native and introduced plants in nature; factors affecting California plant distribution and relationships. Emphasis on local species. Several extended field trips. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: BOT 123 or equivalent.

## 314 BUS

### **BOT 334 Morphology of Vascular Plants (4)**

GEB B.1.b.

Phylogenetic relationships of the plant kingdom as illustrated by comparative morphology of the vascular plants including living and fossil forms. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

### **BOT 335 Plant Anatomy (4)**

GEB B.1.b.

Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

### **BOT 337 Algology (4)**

GEB B.1.b.

Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

### **BOT 343 Advanced Plant Taxonomy (3)**

GEB B.1.b.

Systems of plant classification and principles on which they are based; use of morphology, cytogenetics, and ecology in classification; rules of botanical nomenclature. 2 lectures, 1 laboratory. Prerequisite: BOT 123.

### **BOT 425 Plant Virology (4)**

Plant pathogenic viruses, their plant, insect, nematode and fungal host-pathogen relationships, symptom recognition, isolation and identification methods. 2 lectures, 2 laboratories. Prerequisite: BOT 323.

### **BOT 426 Mycology (4)**

Comparative morphology and nuclear behavior of the fungi. A summary of the science with special attention given to forms important in agriculture, medicine and industry. 2 lectures, 2 laboratories. Prerequisite: BOT 122, ZOO 132, or consent of instructor.

### **BOT 431 Advanced Plant Pathology (4)**

Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

## **BUS—BUSINESS**

### **BUS 101 The Business Enterprise (4)**

Orientation to the business administration program. Examination of the business enterprise, stressing its historical, environmental, and economic setting. Business organization and functions. 4 lectures.

### **BUS 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### **BUS 201 Business Law Survey (3)**

Overview of business law for other than business majors. Similar in scope to BUS 207, but in less detail. Not acceptable for credit toward Business Administration degree. 3 lectures.

### **BUS 205 Consumer Law (3)**

Concepts of legal and self-protection in the marketplace. Procedures to use administrative agencies and court system. Specific interest areas: landlord-tenant; sales and warranties; consumer protection groups; home, auto, insurance purchases, etc. 3 lectures.

### **BUS 207 Business Law (4)**

American legal system, contracts, agency, business organizations, and real property. 4 lectures. Prerequisite: Sophomore standing.

**BUS 308 Advanced Business Law (4)**

Legal aspects of management decisions, including problems arising in sales, commercial paper, personal property and bailments, secured transactions, bankruptcy, competitive torts, and insurance, with emphasis on uniform commercial code. 4 lectures. Prerequisite: BUS 207 or equivalent and junior standing.

**BUS 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research, studies, or surveys of selected problems. May be repeated for a maximum of 4 units of credit. Prerequisite: Senior standing or consent of instructor.

**BUS 404 Governmental and Social Influences on Business (4)**

GEB D.4.b.

Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law and regulatory policy, antitrust law, public policy analysis, and the interaction of business and government. 4 lectures. Prerequisite: Senior standing.

**BUS 430 Internship (4-8) (CR/NC)**

Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of department head.

**BUS 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**BUS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**BUS 500 Independent Study (1-4)**

Advanced study planned and completed under the direction of a member of the Business Administration department faculty. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

**CE—CIVIL ENGINEERING****CE 111 Civil Engineering Fundamentals I (1) (CR/NC)**

Description of the field of civil engineering and the function of the professional civil engineer. Introduction to the major subdivisions of civil engineering including environmental, geotechnical, structural, and water resource engineering. Credit/No Credit grading only. 1 lecture.

**CE 112 Civil Engineering Fundamentals II (2)**

Continuation of CE 111. Application of basic design criteria to specific design problems, use of Civil Engineering department library computer programs for planning, analysis, and design. 2 activities. Prerequisite: MATH 141, PHYS 131.

**CE 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CE 202, 203 Mechanics of Materials (3) (2)**

Stresses, strains and deflections due to axial, torsional, and flexural loading. Statically indeterminate members and columns; Mohr's Circle and column buckling. Emphasis on problem solving. May not be substituted for CE 204 or CE 205. CE 202: 3 lectures; CE 203: 1 lecture, 1 laboratory.

**CE 204, 205 Strength of Materials (3) (2)**

Stresses, strains and their relations applied to axial, torsional and flexural loads. Statically indeterminate axial members, beams and shafts. Columns, dynamic loads, repeated loads. Tension, compression, bending, shear, and torsion tests. Use of the SR-4 strain rosette for determining principal strains. CE 204: 3 lectures; CE 205: 2 lectures. Prerequisite: ME 211.

**CE 206 Strength of Materials Laboratory (1)**

Physical properties of engineering materials. Tension, compression, bending, shear, and torsion tests. Stress and strain transformation. Current strain gauge technology. 1 laboratory. Concurrent: CE 205.

**CE 221 Transportation Engineering I (4)**

Review of highway, air, rail, mass transit and other modes. Evolution of U.S. transportation system. Transportation planning and operations. Feasibility analysis. Systems analysis, policy and management. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or consent of instructor.

**CE 259 Civil Engineering Materials (2)**

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories. Prerequisite: CE 204.

**CE 336 Water Resources Engineering (4)**

Application of rainfall intensity, frequency and duration statistics to design of hydraulic systems. Groundwater hydrology. Hydraulics of open channel flow and pressure conduits, flow through hydraulic structures, pumps and pump application. 4 lectures. Prerequisite: ME 341.

**CE 337 Hydraulics Laboratory (1)**

Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory. Prerequisite: ME 341.

**CE 352, 353 Structural Analysis I and II (3) (3)**

General structural theorems, energy methods, influence diagrams, deflection of structures, analysis of statically determinate and indeterminate structures. Introduction to matrix methods of analysis and dynamic response. 3 lectures. Prerequisite: CE 204, CE 205.

**CE 355 Reinforced Concrete Design (3)**

Underlying principles of layout, selection of type and size of various units, and principles of loading involved in designing public works systems in urban and rural locations. 3 lectures. Prerequisite: CE 353.

**CE 381 Geotechnical Engineering I (4)**

General introduction to physical and engineering properties of soil, including origin, classification and identification methods, permeability, seepage, consolidation, soil strength, slope stability and soil compaction. Standard laboratory tests will be performed. 3 lectures, 1 laboratory. Prerequisite: CE 205, ME 341.

**CE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CE 407 Structural Dynamics (4)**

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 4 lectures. Prerequisite: CE 353.

**CE 421 Transportation Engineering II (4)**

Elements of ground circulation and planning. Driver and vehicle performance. Traffic counting analysis and control. Planning of ground transportation units and terminals as elements of complete transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221, MATH 141, STAT 212 or equivalent.

**CE 422 Geometric Design of Highways (4)**

Location and safe geometric design of highway and other transportation facilities. Earthwork and drainage related to highway, railway, dock, and airport design. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. 3 lectures, 1 laboratory. Prerequisite: CE 221.

**CE 424 Public Transportation (4)**

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 activity. Prerequisite: Senior standing or consent of instructor.

**CE 431 Coastal Hydraulics (3)**

Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 3 lectures. Prerequisite: CE 336 or equivalent.

**CE 440 Water and Wastewater Engineering (4)**

Water and wastewater flows, design of water distribution systems, physical unit operations and chemical unit processes for water and wastewater treatment, biological unit processes for wastewater treatment, introduction to the design of water and wastewater treatment systems. 4 lectures. Prerequisite: CE 336, CE 337, ENVE 331.

**CE 453 Structural Steel Design (3)**

Design and behavior of the elements of steel structures. Proportioning of members and connections. Introduction to plastic design. 3 lectures. Prerequisite: CE 353.

**CE 454 Structural Design (4)**

Design of reinforced concrete, steel and timber structures. Load analysis, code design requirements and connection design. Comprehensive design projects. 2 lectures, 2 laboratories. Prerequisite: CE 353, CE 355, CE 453.

**CE 455 Advanced Strength of Materials (3)**

Equations of equilibrium and continuity in elastic solids. Generalized Hooke's Law. Two-dimensional solutions of beams, disks, rings under various loading conditions. Stress concentrations and their engineering significance. Strain-energy methods of solution. 3 lectures. Prerequisite: CE 353, CE 453, senior or graduate standing.

**CE 461, 462 Senior Project (2) (3)**

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**CE 464 Professional Practice (3)**

Principles of professional engineering practice, the consulting engineer, engineering management, engineer-client relationships, professional ethics, marketing of engineering services, engineering agreements, case studies, analysis of uncertainty in engineering design. 3 seminars. Prerequisite: Senior standing.

**CE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**CE 481 Geotechnical Engineering II (4)**

Applications of soil mechanics principles and foundation engineering. Topics include: methods of subsurface exploration, lateral earth pressures, types and methods of design and construction of foundations of structures (including single and combined footings, mats, piles and caissons). Some advanced laboratory tests will be performed. 3 lectures, 1 laboratory. Prerequisite: CE 381.

**CE 487 Rock Mechanics (3)**

Methods for describing rock properties and application of rock mechanics for surface and underground excavations and foundations. Classification, stress and deformation, rock strength, underground openings, rock slope engineering and foundations. 3 lectures. Prerequisite: CE 481 or equivalent.

**CE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**CE 521 Airfield and Highway Pavement Designs (4)**

Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of rigid and flexible pavements. Construction and maintenance procedures for pavements and stabilized bases. 3 lectures, 1 laboratory. Prerequisite: CE 259, graduate standing or consent of instructor.

**CE 523 Transportation Systems Planning (4)**

Planning of urban and statewide transportation systems. Air, water, rail, highway, and pipeline systems separately and in combination. Selection of routes and types of systems based on economic, social, technological, and other characteristics. Planning of terminals for all types of transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221, ECON 211, IE 314, graduate standing or consent of instructor.

**CE 525 Airport Planning and Design (4)**

Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage; design of heliports. 3 lectures, 1 laboratory. Prerequisite: CE 221 or equivalent, graduate standing or consent of instructor.

**CE 527 Traffic Engineering—Operations and Controls (4)**

Techniques for making traffic engineering investigations; traffic laws and ordinances, speed regulation, curb parking regulations, through controls, one-way streets, right-of-way regulations; design and application of signs, markings, lighting; and traffic engineering. 3 lectures, 1 laboratory. Prerequisite: CE 221 or equivalent, graduate standing or consent of instructor.

**CE 533 Advanced Water Resources Engineering (3)**

Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 3 lectures. Prerequisite: CE 336 or AE 315, graduate standing or consent of instructor.

**CE 534 Groundwater Hydraulics and Hydrology (3)**

Differential equations of groundwater flow, Darcy Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 3 lectures. Prerequisite: CE 336, graduate standing or consent of instructor.

**CE 554 Matrix Analysis of Structures (3)**

Matrix terminology and operations; matrix procedures for analysis of continuous beams, plane frames, and space frames under static and quasi-static loading; stiffness and flexibility methods; computer applications; special techniques for larger systems. 3 lectures. Prerequisite: CE 352, CE 353, graduate standing or consent of instructor.

**CE 558 Introduction to Finite Element Analysis (3)**

Formulation of the finite element method. Finite elements and their properties. Analysis of plates, shells and framed structures under static and dynamic loads. Digital computer implementation of the finite element method. 3 lectures. Prerequisite: CE 355, graduate standing or consent of instructor.

**CE 559 Plates and Shells (3)**

Methods of calculating stresses and deformation in flat plates and thin shells used in engineering structures. Bending of rectangular and circular plates under various loading conditions. Membrane theory of shells of revolution with application in the design of domes, containers and pressure vessels. 3 lectures. Prerequisite: CE 353, CE 355, CE 453, graduate standing or consent of instructor.

**CE 570 Selected Advanced Topics, (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 571 Graduate Seminar (2)**

Current trends and characteristics of civil engineering. Group discussions of skills, techniques and practices. Reports and discussions by students, based on topics of interest to persons preparing for a career in civil engineering. 2 seminars. Prerequisite: Graduate standing in Civil/Environmental Engineering or consent of instructor.

**CE 573 Public Works Administration (3)**

Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 574 Computer Applications in Civil Engineering (3)**

Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 2 lectures, 1 activity. Prerequisite: Graduate standing or consent of instructor.

**CE 584 Advanced Soil Mechanics I (3)**

Engineering behavior of soil through the examination of its chemical, physical and mechanical properties, classification and identification of soils, surface chemistry of clays, stress and deformation, and steady state flow. 3 lectures. Prerequisite: CE 481 or equivalent, graduate standing or consent of instructor.

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### CE 585 Advanced Soil Mechanics II (3)

Engineering behavior of soil. Stress distribution, numerical analysis of flow and stress, limiting equilibrium analysis, soil dynamics. 3 lectures. Prerequisite: CE 584 and graduate standing.

### CE 586 Advanced Foundation Engineering (4)

Illustrative design examples drawn from soil and rock engineering problems encountered in civil engineering, including earth retaining structures, shallow foundations and deep foundations. 4 lectures. Prerequisite: CE 481, graduate standing or consent of instructor.

### CE 599 Design Project (Thesis) (2) (2) (5)

This course provides the opportunity for individual study/research leading toward a Master's thesis. Prerequisite: Graduate standing.

## CFD—CHILD AND FAMILY DEVELOPMENT

### CFD 101 Orientation (2) (CR/NC)

Introduction to the child development major from campus, career and personal perspectives. Offered only on a Credit/No Credit basis. 2 lectures.

### CFD 103 Pairing and Marriage (3)

A functional approach to contemporary dating and pairing patterns with emphasis on cross-sex communication during the developmental stages of the paired relationship. 3 lectures.

### CFD 108 Child, Family, and Community (3)

Influence of parents, teachers, cultural forces, community programs and legislation on the development of individuals across the lifespan. 3 lectures.

### CFD 109 Parenting (3)

A wide variety of philosophies and techniques explored out of which an individual can devise an effective parenting style. Basic skills for parent effectiveness. 3 lectures.

### CFD 125 Infant and Toddler Development (3)

Development and behavior from conception to age three. Characteristic social, physical and sensorimotor behavior patterns of infants and toddlers in relation to the environment. 3 lectures. Prerequisite: PSY 201 or PSY 202.

### CFD 130 Beginning Study of Children and Families (3)

Introduction to children and families in an on-campus, faculty-supervised laboratory program. Participant observation and interaction with children, teachers, peers and parents. By arrangement.

### CFD 200 Special Problems for Undergraduates (1-3)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

### CFD 203 Family Development (3)

Survey of family living at each stage of the life cycle. Emphasis on developmental approach to understanding families, family subsystems, and family developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

### CFD 225 Preschool and Middle Childhood Development (3)

Development and behavior from age three through age ten. Intellectual, physical, emotional, social, and moral development of the young child. 3 lectures. Prerequisite: CFD 125 or consent of instructor.

### CFD 229 Program Planning for Young Children (2)

Curriculum development and analysis of programs for young children with emphasis on activities, environment and communication. 2 two-hour activities. Prerequisite: CFD 130, CFD 225. Concurrent with CFD 230.



**CFD 230 Intermediate Study of Children and Families (3)**

Faculty supervised, on-campus laboratory experience with children, educational aides, colleagues, and parents. The roles of teacher, caregiver, and parent liaison are experienced and analyzed by each student. Prerequisite: CFD 130, CFD 225. Concurrent with CFD 229 and CFD 231.

**CFD 231 Seminar in Intermediate Study of Children and Families (1)**

Seminar concurrent with faculty supervised, on-campus experience with children and families in a laboratory setting. 1 seminar. Prerequisite: CFD 130, CFD 225. Concurrent with CFD 229 and CFD 230.

**CFD 303 Family Interaction (3)**

Dynamic aspects of family interaction. Examination of the various dimensions of family interaction that result in the dynamic quality of family life. 3 lectures. Prerequisite: CFD 103, CFD 203 and junior level standing.

**CFD 304 The Helping Relationship (3)**

Basic skills common to helping relationships with children and families. Theory, practice and case applications of helping. Differentiation between professional, paraprofessional and nonprofessional helping relationships. 1 lecture, 2 laboratories. Prerequisite: CFD 230 or consent of instructor.

**CFD 325 Adolescence (3)**

Analysis of the years between prepubescence and young adulthood. Current research on development and behavior including interaction patterns with peers, family, and others, as well as interrelations among physical, cognitive, and social development of the individual. 3 lectures. Prerequisite: CFD 225 or consent of instructor.

**CFD 329 Introduction to Research in Child and Family Studies (3)**

Practicum in current approaches to research in child and family studies. Principles and methods for studying children and families. 3 lectures. Prerequisite: Junior standing.

**CFD 330 Supervised Internship (6)**

Faculty-supervised internship in a career-related setting for child development students. The role of professional apprentice is experienced and analyzed by each student. Prerequisite: CFD 230, CFD 304, PE 280, junior standing and consent of instructor.

**CFD 400 Special Problems for Advanced Undergraduates (1-3)**

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**CFD 401 Foundations of Child Development (3)**

Past, present and future perspectives in theory and research on child development and on programs for young children. 3 seminars. Prerequisite: CFD 330 or consent of instructor.

**CFD 404 Administration of Child Development Centers (3)**

Organization and administration of programs for young children, preschool and child care centers. Staffing, finance, equipment, records, program evaluations, regulations, public policy and community relations. 3 lectures. Prerequisite: CFD 330, CFD 401.

**CFD 413 Parent-Child Relationships (3)**

Application of major theories to understanding of parent-child relations. Review of current research and evaluation of literature on parent-child interactions. 3 lectures. Prerequisite: CFD 203, CFD 225 or consent of instructor.

**CFD 421 Developmental Processes (3) (Also listed as PSY 421)**

Critical examination of developmental processes in the three major domains of development: psychomotor-physiological, social-affective, and cognitive. Particular attention to the identification, assessment and relevance of specific processes, and to factors that influence and facilitate their development. Class schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: CFD 125, CFD 225, CFD 230 and CFD 325, or graduate standing and consent of instructor.

**CFD 425 Adulthood and Aging (3)**

Analysis of the stages of adulthood. Current research on the aging process including interaction patterns with the family, peers, and others, as well as interrelations among physical, cognitive, and social development of the individual. 3 lectures. Prerequisite: CFD 325 or consent of instructor.

**CFD 430 Advanced Internship (6)**

Faculty-supervised preprofessional experience in a career-related setting which complements the CFD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Prerequisite: CFD 329, CFD 330, CFD 401, CFD 421 and consent of instructor. 6 units required for Child Development concentration students. Total credit limited to 12 units.

**CFD 450 Introduction to Family Therapy (3)**

Basic elements of marriage and family therapy. Emphasis on concepts, goals, and techniques of various family therapy approaches. 3 lectures. Prerequisite: Upper division or graduate standing or consent of instructor.

**CFD 451 Seminar in Family Crises (3)**

Analysis of causes and effects of crises on the family. Methods for prediction, control, and solution of family crises. 3 seminars. Prerequisite: Upper division or graduate standing or consent of instructor.

**CFD 453, 454, 455 Supervised Field Work (6) (6) (6)**

Supervised field work in public or private agencies. Maximum of 6 units per quarter. Minimum of 12 units required for Family Studies concentration students. Prerequisite: CFD 230, CFD 304, junior standing and consent of instructor.

**CFD 459 Life Span Development (3) (Also listed as PSY 459)**

Theories of psychological development. Emphasis on developmental stages and corresponding tasks, emotions, and behaviors. Continuities and orderly sequences in development. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**CFD 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. The project must be related to the child or family fields. Results of the project must be presented in a formal, written report. Minimum of 150 hours total time. Prerequisite: CFD 329, CFD 330 or CFD 453 and consent of instructor.

**CFD 463 Undergraduate Seminar (2)**

Exploration of career and graduate school options in child development and family studies. Definition of personal goals, career and life planning. Topical issues are addressed. 2 seminars. Prerequisite: Senior standing.

**CFD 464 Current Issues in Family Life Education (3)**

Evaluation of the role of family life specialists in relation to the teaching profession, public service agencies, and the community. 3 lectures. Prerequisite: CFD 453, CFD 454.

**CFD 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CFD 481 Family Theory (3)**

Critical analysis and discussion of the current theories used to explain family behavior including their application in the helping professions and family research. 3 seminars. Prerequisite: Senior standing.

**CHEM—CHEMISTRY****CHEM 106 Introductory Chemistry (3)**

Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. An introductory course in chemistry, not open to students who have credit for a college chemistry course. 3 lectures. Prerequisite: MATH 103 or equivalent.

**CHEM 121 General Chemistry (3)****GEB B.1.a.**

Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, and energy with attention to applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering and Technology or Science and Mathematics. Not open to students with credit for CHEM 124 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

**CHEM 122 General Chemistry (4)****GEB B.1.a.**

Continuation of CHEM 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, nonmetals, applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering and Technology or Science and Mathematics. Not open to students with credit for CHEM 125 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

**CHEM 124 General Chemistry (4)****GEB B.1.a.**

Atomic structure, chemical equations, stoichiometry (mass balance in chemical reactions), naming of simple inorganic compounds, solutions. Introduction to carbon compounds emphasizing fuels and polymers. Intended primarily for engineering majors, except Engineering Technology and Industrial Technology. Not open to students with credit for CHEM 121 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

**CHEM 125 General Chemistry (4)****GEB B.1.a.**

Introduction to chemical thermodynamics (energy balance in chemical reactions), equilibrium, rates of reaction, acids and bases, coordination compounds, oxidation-reduction reactions, electrochemistry, corrosion, nuclear chemistry. Intended primarily for students whose majors are in the School of Engineering and Technology. Not open to students with credit for CHEM 122 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124.

**CHEM 127 General Chemistry (4)****GEB B.1.a.**

Introduction to atomic structures, bonding, stoichiometry, nomenclature, gas laws, states of matter and solutions. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 121 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: High school algebra and chemistry or CHEM 106.

**CHEM 128 General Chemistry (4)****GEB B.1.a.**

Continuation of CHEM 127. Discussion of colligative properties, colloids, kinetics, equilibria, acid-base equilibria, nuclear chemistry, thermochemistry and electrochemistry. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 122 or CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

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### CHEM 129 General Chemistry (4)

GE B.1.a.

Chemical equilibria, compounds of the metals, laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. Intended primarily for students whose majors are in the School of Science and Mathematics. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128, or consent of instructor.

### CHEM 156 General Chemistry Laboratory (1)

GE B.1.a.

Additional laboratory to be taken with CHEM 129. Includes chemical properties and semi-micro qualitative analysis of the transition and post-transition metals. Ions of the periodic table, spectrographic analysis, methods of inorganic synthesis. 1 laboratory. Prerequisite: CHEM 122, CHEM 125, or CHEM 128.

### CHEM 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### CHEM 252 Laboratory Glassblowing (1)

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 121, CHEM 124 or CHEM 127.

### CHEM 253 Chemical Literature (1)

Chemical periodicals, patents, abstracts; Beilstein, Gmelin; reference books and encyclopedias; literature searches, computerized information retrieval. 1 lecture. Prerequisite: CHEM 326 or CHEM 316.

### CHEM 301 Biophysical Chemistry (3)

Basic physical chemistry for the study of biological systems. Kinetic-molecular theory, gas laws, principles of thermodynamics as applied to biochemical systems. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 328 or concurrent CHEM 371, PHYS 123 or PHYS 133, MATH 132 or MATH 142.

### CHEM 302 Biophysical Chemistry (4)

Application of physical chemistry to biochemical systems. Buffers, electrochemistry, reaction rate theory, enzyme kinetics, viscosity, surface and transport properties of macromolecules. Not open to students with credit in CHEM 306. 3 lectures, 1 laboratory. Prerequisite: CHEM 301 or CHEM 305; CHEM 328 or CHEM 371.

### CHEM 305 Physical Chemistry (3)

GE B.1.a.

Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 132 or MATH 142.

### CHEM 306 Physical Chemistry (3)

Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305.

### CHEM 307 Physical Chemistry (4)

Introduction to quantum theory. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures, 1 laboratory. Prerequisite: CHEM 302 or CHEM 306 and CHEM 356, or consent of instructor.

### CHEM 316 Organic Chemistry (4)

GE B.1.a.

Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

**CHEM 317 Organic Chemistry (5)**

Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 316.

**CHEM 318 Organic Chemistry (5)**

Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 317.

**CHEM 326 Survey of Organic Chemistry (4)**

GEB B.1.a.

Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in CHEM 316. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

**CHEM 328 Biochemistry (4)**

GEB B.1.a.

Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the application of chemistry to the areas of agriculture, human health and nutrition, and the production of food and animal feeds. 3 lectures, 1 laboratory. Prerequisite: CHEM 326.

**CHEM 331 Quantitative Analysis (5)**

GEB B.1.a.

Theory and application of chemical equilibrium to analytical problems. Survey of important analytical methods with stress placed on the theory and application associated with titrimetric and spectrophotometric analysis. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.

**CHEM 332 Quantitative Analysis (4)**

Analytical techniques stressing procedures based upon titrimetric precipitometry, gravimetric analysis and continuation of redoximetry. Properties of precipitates and colloids as applied to industrial analytical chemistry. 2 lectures, 2 laboratories. Prerequisite: CHEM 331.

**CHEM 335 Clinical Chemistry (3)**

Basic principles of physiological chemistry including clinical significance of medical laboratory data. Introduction to medical laboratory techniques used in the quantitative determination of glucose, protein, hemoglobin and electrolytes in biological fluids including blood, serum, and urine. 2 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371, and CHEM 331.

**CHEM 336 Clinical Chemistry (4)**

Advanced principles of physiological chemistry including clinical significance of medical laboratory data. Theoretical and practical aspects of diagnostic enzymology and biochemical profiling. Medical laboratory techniques used in the determination of renal and liver function, lipids, enzymes, hormones, and toxic substances. 2 lectures, 2 laboratories. Prerequisite: CHEM 335.

**CHEM 341 Environmental Chemistry I (3)**

GEB B.1.a.

Nature, composition, reactions, redox equilibria and complexation in natural water systems. Microorganisms as aquatic catalysts, heterogeneous reactions, chemical aspects of water treatment and pollution. 3 lectures. Prerequisite: CHEM 129.

**CHEM 342 Environmental Chemistry II (3)**

GEB B.1.a.

Nature and composition of the atmosphere. Oxides of carbon, sulfur and nitrogen. Organic and inorganic pollutants, particulate matter, photochemical smog. Environmental chemistry of soil and mineral resources. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

**CHEM 344 Chemical Process Principles (3)**

Fundamental terms, concepts, and principles used in the chemical processing industries. 3 lectures. Prerequisite: CHEM 316 or consent of instructor.

## 326 CHEM

### CHEM 350 Chemical Safety (1)

GEB B.1.a.

Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture. Prerequisite: CHEM 326 or equivalent.

### CHEM 355 Physical Chemistry Laboratory (1)

Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: CHEM 305.

### CHEM 356 Physical Chemistry Laboratory (1)

Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: CHEM 306.

### CHEM 371 General Biochemistry I (4)

GEB B.1.a.

Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates, vitamins. 3 lectures, 1 laboratory. Prerequisite: CHEM 326 or 317. Strongly recommended: CHEM 331.

### CHEM 372 General Biochemistry II (3)

Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures. Prerequisite: CHEM 371.

### CHEM 373 General Biochemistry III (3)

Synthesis, conformation and structure of biopolymers: nucleic acids and proteins. Function of macromolecular complexes: cell walls, ribosomes, membranes, and others. Biochemical genetics, cell differentiation and regulation, viruses and biochemical evolution. 3 lectures. Prerequisite: CHEM 371.

### CHEM 374 Biochemistry Laboratory (2)

Experiments in metabolism, including animal and microbial studies; isolation and characterization of enzymes and nucleic acids. 2 laboratories, offered during the same day or on consecutive days to simulate biochemical research conditions. Prerequisite: CHEM 371.

### CHEM 377 Chemistry of Drugs and Poisons (3)

Introduction to pharmacology: history, sources, development, and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons acting on the nervous, cardiovascular, immune and hormone systems, and on cancer, infectious disease, etc. Especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 328 or CHEM 371 or consent of instructor.

### CHEM 378 Biochemical Pharmacology (3)

Consideration of current selected topics in pharmacology including drug design, biochemical mechanisms of drug activity and issues pertaining to the disposition of drugs to the public. Lecture, professional consultation, library research, and student presentations. 3 lectures. Prerequisite: CHEM 377 or equivalent as determined by instructor.

### CHEM 385 Geochemistry (3)

Application of chemical principles to terrestrial and extraterrestrial systems. Formation of the elements; chemical influences on the earth's formation; chemical evolution studies; age-dating techniques; reactions in sea water; petroleum and ore formation; distribution and movement of the elements. 3 lectures. Prerequisite: CHEM 316, CHEM 331.

### CHEM 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CHEM 405 Advanced Physical Chemistry (3)**

Fundamentals of quantum chemistry and their application. Selected advanced topics in physical chemistry. 3 lectures. Prerequisite: CHEM 307.

**CHEM 419 Advanced Organic Chemistry (3)**

A detailed study of the mechanisms of organic reactions and related topics. 3 lectures. Prerequisite: CHEM 305, CHEM 318.

**CHEM 435 Food Analysis (4)**

Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, forage crops, meat and meat products, milk and dairy products, eggs and poultry products. Vitamin determinations, microbiological assay, quality control, taste testing, legal specifications, grading and labeling. 3 lectures, 1 laboratory. Prerequisite: A course in biochemistry.

**CHEM 436 Agricultural Chemicals (4)**

Chemistry of fungicides, insecticides, rodenticides, plant growth regulators, soil conditioners, and fertilizers. Special reference to the analysis, manufacture, toxicology, legal specification, and regulations. 3 lectures, 1 laboratory. Prerequisite: A course in biochemistry.

**CHEM 439 Instrumental Analysis (5)**

Optical, electroanalytical and other techniques of modern instrumental analysis. Current industrial applications. Laboratory work in instrumental methods emphasized. 3 lectures, 2 laboratories. Prerequisite: CHEM 306, CHEM 331, CHEM 356 or CHEM 302, CHEM 331. Recommended: CHEM 307.

**CHEM 444 Polymer Chemistry (3)**

Polymerization methods and reaction mechanisms; physical properties of polymers and their measurement; chemistry of initiators, catalysts and inhibitors; stereospecific polymers; uses of representative types. 3 lectures. Prerequisite: CHEM 317.

**CHEM 457 Qualitative Organic Analysis (3)**

Experimental determination of the identity of organic compounds. Emphasis on chemical methods. 1 lecture, 2 laboratories. Prerequisite: CHEM 317.

**CHEM 458 Instrumental Organic Qualitative Analysis (2)**

Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy. 2 laboratories. Prerequisite: CHEM 457.

**CHEM 459 Undergraduate Seminar (2)**

Oral presentation of current developments in chemistry based on current literature. Preparation for employment and for independent work in chemistry. 2 seminars. Prerequisite: Senior standing.

**CHEM 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: CHEM 459.

**CHEM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: CHEM 301, or CHEM 305, or CHEM 317 or consent of instructor.

**CHEM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**CHEM 481 Inorganic Chemistry (3)**

A systematic study of important elements based on periodic grouping and atomic structure with emphasis on chemical bonding, coordination compounds, and acid-base relationships. 3 lectures. Prerequisite: CHEM 306 or consent of instructor.

**CHEM 482 Synthetic Inorganic Chemistry (3)**

Inorganic systems. Discussion of the historical development of inorganic compounds and their uses. Emphasis on symmetry, isomerism, structure, and methods of synthesis. Laboratory involves preparation of inorganic compounds using high temperature, inert atmosphere, photolysis, electrolytic and other synthetic techniques. 2 lectures, 1 laboratory. Prerequisite: CHEM 481 or consent of instructor.

**CHEM 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated the ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department graduate coordinator.

**CHEM 501 Physical Chemistry—Thermodynamics (3)**

Fundamental theory and methods of thermodynamics, with application to the calculation of thermodynamic properties. 3 seminars. Prerequisite: CHEM 307, CHEM 316 or consent of instructor.

**CHEM 502 Physical Chemistry—Quantum Chemistry (3)**

Theory and methods of quantum chemistry with application to the investigation of molecular structure, chemical bonding, and molecular spectra. 3 seminars. Prerequisite: CHEM 405 or consent of instructor.

**CHEM 503 Kinetics and Catalysis (4)**

Reaction rates and mechanisms of homogeneous and heterogeneous, noncatalyzed and catalyzed reactions. Interdisciplinary laboratory skills development related to industrial catalysis research. 2 lectures, 2 laboratories. Prerequisite: CHEM 307, CHEM 318 or consent of instructor.

**CHEM 514 Advanced Organic Chemistry—Synthesis (3)**

Modern methods of organic synthesis. Carbon-carbon bond forming reactions, functional group transformations, protecting groups, strategies of total synthesis of natural products. 3 seminars. Prerequisite: CHEM 318.

**CHEM 515 Advanced Organic Chemistry—Mechanisms (3)**

Mechanisms of pericyclic reactions; selection rules. Introduction to photochemistry; free radical reactions. 3 seminars. Prerequisite: CHEM 318.

**CHEM 516 Advanced Organic Chemistry—Natural Products (3)**

Structure determination and total synthesis of compounds of biological origin. 3 seminars. Prerequisite: CHEM 318.

**CHEM 528 Nutritional Biochemistry (3)**

Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism. Emphasis on current research and controversy. 3 lectures. Prerequisite: Course in biochemistry.

**CHEM 541 Synthetic Methods (2-4)**

Techniques for synthesis of organic and inorganic substances. Use of modern equipment and methods; inert atmosphere, low and high temperature, low and high pressure, semi-micro technique, separation and purification techniques. 2 to 4 laboratories. Prerequisite: CHEM 458.



**CHEM 572 Advanced Biochemistry (3)**

Protein structure and function. Lecture, library research and student presentations. Topics encompass considerations of the physical structure of proteins, domain theory, protein folding, and current methods of structural analysis as well as methods for determining enzyme mechanisms including kinetics, isotope effects, stereochemistry, cryoenzymology, trapping of intermediates, and transition state analogues. 3 lectures. Prerequisite: CHEM 371 and CHEM 302 or CHEM 306 or equivalents as determined by instructor.

**CHEM 573 Advanced Biochemistry (3)**

Advanced study of nucleic acid structure and function. Format includes lecture, library research and student presentations. Topics include mechanisms of genetic regulation and cell differentiation, advances in knowledge of nucleic acid sequence and organization, chromosome structure, and molecular aspects of genetic diseases, including cancer. 3 lectures. Prerequisite: CHEM 373 or equivalent.

**CHEM 574 Advanced Biochemistry (3)**

Advanced study of membranes and metabolism. Lecture, library research and student presentations. Membrane structure and function, hormone interactions, mitochondria structure and function, immunochemistry and neurochemistry. 3 lectures. Prerequisite: CHEM 373 or equivalent as determined by instructor.

**CHEM 590 Graduate Seminar (1)**

Advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 seminar. Prerequisite: Graduate standing in chemistry, or consent of instructor.

**CHEM 598 Internship (3-6)**

Supervised technical field experience in areas such as chemical sales, manufacturing, process development, clinical chemistry, analytical chemistry, pollution control. Prerequisite: Graduate standing or consent of instructor, and approval of the department head and school dean.

**CHEM 599 Thesis (3) (3) (3)**

Individual research under the general supervision of the staff leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing in chemistry.

## CM—CONSTRUCTION MANAGEMENT

**CM 321 Concrete Technology (3)**

Study of modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory from 1963 to present. Development of a rational basis for writing concrete specifications and for proportioning concrete mixes. 2 lectures, 1 laboratory. Prerequisite: ARCE 223, ARCE 301.

**CM 325 Construction Management Practices (3)**

Overview of construction methods, building systems, construction and contract documents, cost estimating and scheduling and other practices used in the contracting process. For nonmajors. 2 lectures, 1 activity.

**CM 331 Construction Cost Control (3)**

Basic application of construction cost control systems and the use of cost information and associated reports. 3 lectures. Prerequisite: Third-year standing and one approved accounting course.

**CM 332 Cost Alternatives Evaluation (4)**

Basic principles of economic evaluations between cost alternatives. 4 lectures. Prerequisite: Third-year standing in Construction Management.

**CM 333 Construction Contracts Administration (3)**

Administration of construction documents including invitation to bid, addenda, proposals, change orders, subcontracts, liens, claims, waivers, and arbitration. 3 lectures. Prerequisite: Third-year standing, BUS 201.

**CM 341 Wood and Masonry Construction Practices (4)**

Building systems, equipment, materials, and techniques. One designated field trip required. 1 lecture, 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 342 Concrete and Formwork Construction Practices (4)**

Building systems, equipment, materials, and techniques. One designated field trip required. 1 lecture, 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 343 Steel and Earthwork Construction Practices (4)**

Building systems, equipment, materials, and techniques. One designated field trip required. 1 lecture, 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 350 Computer Applications in Construction Management (2)**

Application of computer systems to control construction operations in the building industry. Development of construction management games. 2 lectures. Prerequisite: CSC 110 or EDES 250, STAT 211.

**CM 351, 352, 353 Building Support System Construction Practices (3) (3) (3)**

Building support systems, equipment, materials and techniques of installation and construction. Emphasis on the role of specialty subcontractors in the construction process. 3 activities. Prerequisite: ARCH 232, PHYS 137.

**CM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CM 412 Construction Regulations (2)**

Laws and legal problems related to the construction industry. Contractor's licensing law, labor laws, lien laws, and safety requirements. 2 lectures. Prerequisite: Fourth-year standing.

**CM 420 Construction Cost Estimating (2)**

Survey of methods and practices of construction cost estimating. Solutions to problems in estimating. For students not majoring in Construction Management. 1 lecture, 1 laboratory. Prerequisite: Fourth-year standing.

**CM 441 Heavy and Civil Works Construction (3)**

Heavy and civil works construction methods, stressing field operations management. 3 activities. Prerequisite: Third-year standing.

**CM 442 Building Estimating (2)**

Procedures for estimating costs of buildings. 2 activities. Prerequisite: CM 341, CM 342, CM 343.

**CM 443 Principles of Construction Management (3)**

Applications of a broad range of construction management techniques to case studies involving a variety of operations in construction firms. 3 activities. Prerequisite: Fourth-year standing.

**CM 451 Industrial and Process Construction (4)**

Methods and procedures used on industrial and process construction projects. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 452 Project Controls (4)**

Planning, organization, scheduling, and control of construction projects. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 453 Project Development (4)**

Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 461, 462 Senior Project (2) (1) (CR/NC)**

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Construction and team projects encouraged. To be completed in two consecutive quarters. 90 hours minimum total time. Credit/No Credit grading only. Prerequisite: CM 341, CM 342, CM 343.

**CM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

## CONS—CONSERVATION

**CONS 311 Introductory Conservation (3)**

Basic principles and problems of conservation. Organization, control and interrelationships of government and private agencies dealing with the conservation of natural resources. 3 lectures. Prerequisite: Junior standing and one course in Biological Sciences.

**CONS 422 Freshwater Fisheries (3)**

Freshwater fish and fishery resources of the Pacific Coast. Identification, life history, ecology and economics of important western and local species. Field trips to various warm and cold water fishery facilities. 2 lectures, 1 laboratory. Prerequisite: ZOO 132, ZOO 322 recommended.

**CONS 431 Game Management (4)**

General principles, problems and techniques of increasing the harvest of waterfowl, upland game, and big game. Identification and life histories of important western game species. Several weekend field trips. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or ASCI 229.

**CONS 433 Aquaculture (4)**

Biological, physical, chemical, and economic aspects of reproduction, development, growth, nutrition, and disease of fish in culture. Modern methods and problems in the culture of warm water species, especially those suited to farm situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 and BIO 334. ZOO 322 recommended.

## CRP—CITY AND REGIONAL PLANNING

### CRP 203 Applied Design and Planning Fundamentals (3) (Also listed as LA 203)

Applications of basic design fundamentals and the design of environments through design exercises. 3 laboratories. Prerequisite: EDES 201, EDES 202, LA 213.

### CRP 211 Introduction to Urbanization (3)

GEB F.2.

Evolution, planning, and design of cities. Interpretation of environmental, social, economic, and technological factors that have influenced the physical organization, planning, and design of cities. 3 lectures.

### CRP 212 Introduction to Urban Planning (3)

GEB F.2.

Problems and responses to contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to planning. 3 lectures.

### CRP 213 Survey Methods (3)

Sources of information and data related to city and regional planning, architecture, and environmental design. Search, selection, reduction of data, and application to program development. 3 lectures. Prerequisite: CRP 212.

### CRP 214 Urban and Regional Processes (3)

How cities and regions work, grow or decline; their relationship to public and private actions. Spatial analysis and locational theories. Integrated perspective for environmental design professions. 3 lectures. Prerequisite: CRP 212.

### CRP 216 Computer Applications for Planning (1)

Introduction to the use of computer facilities and software programs with special applications for planners. 1 laboratory. Prerequisite: CSC 110 or equivalent.

### CRP 218 Exploring Future Environments (3)

Examination and implications of emerging and potential social, technical, and resource changes for human living environments. Futures scenario explorations of characteristics for environmentally and socially sustainable rural and urban communities. Guest lecturers and discussions. 3 lectures.

### CRP 240 Additional Planning Laboratory (1–2)

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

### CRP 243 Site Planning (3)

Art and science of arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human behavior in three-dimensional spaces while minimizing disruption to natural systems. Emphasis on special types including planned unit developments, waterfronts, hillsides, campuses and commercial centers. 3 laboratories. Prerequisite: LA 213.

### CRP 314 Planning Theory (3)

Theory of planning and the role of theory in planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place, and the rational model. 3 lectures. Prerequisite: CRP 214.

### CRP 347, 348 Urban and Regional Design (3) (3)

Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. 3 laboratories. Prerequisite: CRP 203, CRP 216, LA 213.

**CRP 351, 352, 353 Planning Laboratory (4) (4) (4)**

Case study application of planning theory to the community, its components, and to the city and the region. Relationships of city spaces and structures. Redevelopment. Field trips. Individual team, and interdisciplinary approaches. Computer applications. 4 laboratories. Prerequisite: CRP 213, CRP 214, CRP 216, LA 213, GEOG 250, NRM 304, STAT 251.

**CRP 360 Urban Aesthetics (1-3)**

Aesthetics as an important aspect of the physical and social organization of cities. Identification, study, and evaluation of aesthetic design in the context of the present. 1-3 lectures. Prerequisite: Junior standing and consent of instructor.

**CRP 400 Special Problems for Advanced Undergraduates (1-2)**

Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CRP 407 Environmental Law (3) (Also listed as NRM 407)**

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, and consent of instructor.

**CRP 408 Water Resource Law and Policy (3) (Also listed as NRM 408)**

Detailed examinations of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

**CRP 409 Planning Internship (2) (CR/NC)**

Work experience as a supervised employee in a government or related agency. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Credit/No Credit grading. Prerequisite: Fourth year standing in CRP and permission of instructor.

**CRP 418 New Town Planning (3)**

History, present situation and future of new town planning in the United States. Relationship to other countries. 3 lectures. Prerequisite CRP 212.

**CRP 420 Planning Law (3)**

Public controls protecting natural environmental systems. Land use and resource controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 3 lectures. Prerequisite: CRP 353.

**CRP 430 Planning Administration (3)**

Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in planning administration. 3 lectures. Prerequisite: Graduate, second year standing; undergraduate, CRP 451.

**CRP 435 Transportation Theory (3)**

Circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. 3 lectures.

**CRP 447 Urban and Regional Design (5)**

Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. 5 laboratories. Prerequisite: CRP 348, CRP 451.

**CRP 451, 452, 453 Planning Laboratory (5) (5) (5)**

Continuation of CRP 351, 352, 353. 5 laboratories. Prerequisite: CRP 353.

**CRP 457 Planning Information Systems (3)**

Use of a problem-oriented system to retrieve statistical information pertinent in planning. 3 lectures. Prerequisite: CRP 353.

**CRP 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours time. Prerequisite: CRP 353.

**CRP 463 Undergraduate Seminar (2)**

Discussion and lectures on problems of professional practice in planning. Professional ethics. Students present organized material on some subject of interest. 2 seminars. Prerequisite: Senior standing in CRP.

**CRP 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CRP 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**CRP 472 Planning Colloquium (1) (CR/NC)**

Panel discussion by two or more faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Maximum 6 units. Credit/No Credit grading. 1 seminar. Prerequisite: Upper division standing.

**CRP 500 Individual Study (2-3)**

Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units. Prerequisite: Graduate standing with minimum of 12 core units.

**CRP 501, 502 Foundations of Urban and Regional Planning (4) (4)**

Historical and contemporary perspectives of urban and regional development and planning traditions and methodologies. Human settlements and natural environments as holistic systems and their interrelationships. Philosophy of planning. 4 lectures.

**CRP 505 Perspectives in Regional Planning (3)**

History, development and major philosophical approaches of regions and regional planning, both in urban-centered and resource-based regions. Effects of relaxing natural, economic and infrastructure limiting factors on growth and development of regions. The normative hierarchical emphasis of contemporary regional planning compared to emerging paradigms that alter the regional/local planning relationship. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 510 Planning Theory (4)**

Theory of planning. Development of contemporary planning thought from varying sources and perspectives. Intensive study of planning literature. Alternative value systems and planning processes. Current approaches and philosophies in the United States and other countries. 4 seminars.

**CRP 513 Survey and Research Methods (3)**

Design and execution of field surveys, reduction of data to produce information for planning. 3 laboratories. Prerequisite: Graduate standing, STAT 251 or equivalent.

**CRP 515 Graphic Communication for Planners (3)**

Basic techniques used in graphic communication. Orthographic, isometric and perspective drawing. Introduction to various drawing media and delineation and presentation techniques for planners. Designed to develop three-dimensional visualization, graphic skills and basic proficiency in the exploration and communication of information and design ideas. 3 laboratories.

**CRP 516 Quantitative Methods in Planning (4)**

Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**CRP 520 Feasibility Studies in Planning (3)**

Base studies and economic development. Fiscal effectuation of policies and plans. The tax base and tax policies related to land use planning. Social accounting and overhead. Cost benefit studies and economic feasibility of plans. Long-range financial planning. Phasing and time scheduling. 3 seminars. Prerequisite: CRP 502 or equivalent.

**CRP 525 Plan Implementation (4)**

Zoning theory and legal background as a device to guide urban growth; the zoning ordinance, the districting plan. Subdivision regulations; the Capital Improvement program; mandatory referral; eminent domain; official plan lines; building, health, sanitation, housing and fire codes; grants administration. 3 lectures, 1 laboratory. Prerequisite: CRP 353 or consent of instructor.

**CRP 548 Philosophy of Urban Design (3)**

Introduction to the philosophy and theory particular to environmental design. Exploration of evaluation criteria and critical analysis of man's environment related to design and human needs. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 3 seminars.

**CRP 552, 553 Planning Laboratory (4) (4)**

Case study applications of planning theory and processes to urban and regional problems in increasing complexity. Interrelationships and impacts of economic and social conditions, technology, resource use, the natural and the built environments. Field trips. Individual, team and interdisciplinary approaches. 4 laboratories. Prerequisite: CRP 501, CRP 513, CRP 515.

**CRP 554 Advanced Planning Laboratory (4)**

Application of advanced theory and methods to the solution of complex micro and macro scale planning problems of spatial allocation and planning policy. Research, analysis, synthesis and implementation practice. 4 laboratories. Prerequisite: CRP 502 and CRP 553 or equivalent, CRP 420, CRP 510, CRP 516, CRP 525.

**CRP 570 Selected Topics in Planning (3)**

Directed group study of selected topics in planning theory. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 599 Thesis/Project (6)**

Individual research under the general supervision of the faculty, leading to a graduate thesis or project of suitable quality. Prerequisite: Advancement to candidacy.

**CRSC—CROP SCIENCE****CRSC 099 Principles of Agricultural Pest Management (4)**

Identification and control of common insect and vertebrate pests of agricultural crops and stored products. Safe use and handling procedures of insecticides, rodenticides, and avicides. Natural, cultural, mechanical, and chemical controls of injurious insects, mites, mammals, and birds. 3 lectures, 1 laboratory. Not open to degree students for degree credit.

## 336 CRSC

### CRSC 123 Forage Crops (4)

Production, harvest, utilization and value of important forage crops. Adaptation, identification and relative merits of grasses and legumes will be covered. 3 lectures, 1 laboratory.

### CRSC 131 Introduction to Crop Science (4)

Production principles for field and vegetable crops. Fundamental botany, taxonomy and cultural practices. Soil tillage, fertilization, seed selection, planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Production practices for cotton. A field trip to a major California production area is required. 3 lectures, 1 laboratory. Credit will not be allowed for both CRSC 131 and CRSC 230.

### CRSC 132 Grain Crops (4)

Production, adaptation, distribution, and utilization of major grain crops harvested by combine, including wheat, barley, oats, corn, rice, sorghum, rye, triticale, and millets. Field trips to major California cereal production areas. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230.

### CRSC 133 Row Crops (4)

Adaptation, production, processing, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets. Field trip to a major California row crop production area required. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or VGSC 230.

### CRSC 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### CRSC 221 Weed Control (4)

Identification, life histories, and control of common, noxious, and poisonous California weeds. Weed control chemicals and equipment for cultivated crops, irrigation systems, range, wastelands. 3 lectures, 1 laboratory. Prerequisite: Sophomore standing.

### CRSC 230 General Field Crops (4)

GEB F.2.

Production, harvest, and use of important cereal and field crops in California. Production areas, crop rotations, disease and pest control. 3 lectures, 1 laboratory. Credit will not be allowed for both CRSC 131 and CRSC 230.

### CRSC 231 Commercial Seed Production and Processing (4)

Production and processing of certified and commercial seed including seed analysis, germination, quality control, cleaning and storage techniques, and seed laws. Field trip to a seed conditioning plant required. 3 lectures, 1 laboratory. Prerequisite: CRSC 132 or CRSC 133.

### CRSC 304 Plant Breeding (4)

Application of principles of plant improvement through selection, hybridization, and utilization of hybrid vigor. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

### CRSC 305 Advanced Weed Science (4)

Classification and structure of herbicides; physiological processes affecting and affected by herbicides; mode of action; factors influencing herbicide performance; influence of plants and soil on the action of herbicides, symptoms of herbicide injury to plants; principles, development and application of biological means of weed control including the concept of allelopathy. Field trip to weed research areas required. 3 lectures, 1 laboratory. Prerequisite: CRSC 221 or consent of instructor.

### CRSC 311 Applied Insect Pest Management (4)

Principles of controlling insect pests including biological, cultural, physical, mechanical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops including stored products and livestock. Insecticide formulation and methods of application. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.



**CRSC 321 Advanced Insect Pest Management (4)**

Strategies, economics and case histories of insect pest management. Insect population monitoring and modeling. Insect identification. Field trips required. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

**CRSC 322 Crop Technology (3)**

Recent developments in technology relating to advancements in crop production under different cropping systems. 3 lectures. Prerequisite: CRSC 133, BOT 121 and junior standing.

**CRSC 323 Tropical Crop Production (4)**

Production distribution, adaptation and utilization of major field and vegetable crops of economic importance in tropical and subtropical areas. 3 lectures, 1 activity.

**CRSC 327 Vertebrate Pest Management and Control (4)**

Vertebrate pests injurious to crops, livestock, other animals, stored products, and man. Life habits, identification, control methods, and materials. Related laws and regulations. 3 lectures, 1 laboratory.

**CRSC 330 Pasture and Processed Forage Crops (4)**

Three methods of producing, harvesting and utilizing forage species - grazing, haying and ensiling plant materials. Forage identification, hay grades and quality, preservatives to enhance quality, grazing systems, forage mixtures versus single species, problems to pasturing, the silage-making process and silo structures. Field trip to a production area required. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230 or consent of instructor.

**CRSC 333 Nutriculture (4)**

Development, practices, history, and future of crop production using nutrient solutions. Research application, commercial applications, production problems, marketing, and economics. Field trip to a commercial greenhouse operation required. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CRSC 133, SS 221 or consent of instructor.

**CRSC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CRSC 410 Crop Physiology (4)**

Practical studies in plant nutrition, soil-water-plant relationships, seed physiology, growth regulators, pesticide reactions, and controlled environments. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230, and CHEM 328.

**CRSC 411 Experimental Techniques and Analysis (4)**

Principal methods of experimental design and analysis of collected data. Field practice in planning and layout with emphasis on management of agronomic and soils experiments. 3 lectures, 1 laboratory. Prerequisite: Junior or senior standing and MATH 103 or equivalent.

**CRSC 421 Oil and Fiber Crops (4)**

Culture, harvest, grading, and marketing of cotton, soybean, sunflower, safflower, and other oil and fiber crops. Field trips to major centers of production and marketing required. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, CRSC 221 and BOT 121.

**CRSC 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

**CRSC 463 Undergraduate Seminar (2)**

Oral presentation and leadership of group study on recent developments in the major field. 2 seminars.

**CRSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CRSC 521 Advanced Field Crop Production (4)**

Production and management of field crops under both intensive and extensive cultural practices; interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**CRSC 581 Graduate Seminar in Crop Production (3)**

Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 seminars.

**CSC—COMPUTER SCIENCE**

GEB F.1.

(Any CSC course except CSC 200, CSC 400, CSC 461, CSC 462, CSC 463, CSC 470, and all 500-level courses will satisfy GEB requirement F.1.)

**CSC 101 Fortran Programming (2)**

Emphasis on programming techniques for mathematical analysis. Business and science applications. 2 lectures.

**CSC 110 Computers and Computing (3)**

Theoretical understanding of the computer and its auxiliary procedures and systems as intellectual tools, combined with the understanding of the breadth and significance of computer applications in American society, including a demonstrated ability to program in a high level language. Credit not allowed for CSC majors. 3 lectures.

**CSC 118 Fundamentals of Computer Science (4)**

Introduction to programming skills using Pascal: program structure, data types and structures, statements and control, procedures and function, text files, scope. Programming style and concepts: top-down design, stepwise refinement, structured programming and modularity. 3 lectures, 1 activity.

**CSC 120 Principles of Business Data Processing (4)**

Fundamental concepts of digital computing. Survey of computing devices, languages, methods and applications for business data processing. Credit not allowed for CSC majors. 4 lectures. Prerequisite: High school algebra.

**CSC 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CSC 201 Advanced Fortran Programming (3)**

Programming in extended Fortran language with emphasis on program efficiency and advanced features. Comparison of Fortran implementations. 3 lectures. Prerequisite: CSC 101 or equivalent.

**CSC 203 Advanced COBOL Programming (3)**

Structure of the Common Business-Oriented Language (COBOL). Coding fundamentals and program logic. Writing of complete COBOL programs applied to typical business data processing problems. 3 lectures. Prerequisite: Any computer programming course.

**CSC 207 Advanced BASIC Programming (3)**

Advanced programming methods using the BASIC language. Language features, data types, file structures, error handling, and string processing. Structured programming and problem solving techniques in BASIC. 3 lectures. Prerequisite: CSC 110, CSC 118, or CSC 410 or consent of instructor.

**CSC 209 Selected Programming Languages (3)**

Language to be studied will be announced prior to registration for the quarter. Emphasis on language syntax and usage, and features which are peculiar or unique to the language. From point of view of users of the language. Languages studied might include PL/1, C, Modula 2, LISP and others. May be repeated to 6 units. 3 lectures. Prerequisite: Any computer programming course.

**CSC 219 Linear Programming (3)**

Introduction to linear programming, the simplex algorithm, duality, sensitivity and post optimal analysis. Use of linear programming techniques to solve linear optimization models. 3 lectures. Prerequisite: 6 units of college mathematics.

**CSC 221 Computer Principles and Programming (3)**

Introduction to assembly language programming and computer architecture. An introduction to the function of an assembler and the symbol table. Addressing modes and machine language formats. Techniques of assembly language programming. 3 lectures. Prerequisite: CSC 101 or CSC 118, and EL 219.

**CSC 222 Digital Computer Symbolic Programming (3)**

Advanced assembly language programming with emphasis on subroutine linkages and macro-writing. Introduction to I/O with emphasis on sequential files. 3 lectures. Prerequisite: CSC 221.

**CSC 245 Discrete Structures (3) (Also listed as MATH 245)**

Introduction to the discrete structures of computing. Turing machines; computer arithmetic; computability and algorithm complexity; recursion and recursive programming; concurrency and concurrent programming; induction; graphs, trees, state diagrams, and networks; elementary enumeration. 3 lectures. Prerequisite: CSC 118, EL 219, MATH 143.

**CSC 255 Computer Graphics Applications (4)**

For students who wish to learn to use computer graphics in their own disciplines. Plotter and interactive graphic display characteristics and programming. Use of computer graphics facilities. Introduction to interactive graphic display characteristics. Credit not allowed for both CSC 255 and CSC 455. 3 lectures, 1 laboratory.

**CSC 304 Introduction to Digital Computer Architecture (3)**

Comparative computer architecture and microprogramming of contemporary computer systems. Comparison of instruction set processors, addressing modes, input/output synchronization, and memory organization. 3 lectures. Prerequisite: CSC 340.

**CSC 306 Minicomputer Systems (4)**

Computer architectures involving 16-32 bit processors, macroassembly, linkage-editing, and the operating system interfaces to real-time and timesharing systems. Applications programming involving files, communications, floating-point hardware, and system utilities. 3 lectures, 1 laboratory. Prerequisite: CSC 118, CSC 221.

**CSC 309 Microcomputer Architecture and Programming (4)**

Comparison of architecture and instruction sets of microprocessors. Selection criteria and application of microprocessors. Use of application development aids. 3 lectures, 1 laboratory. Prerequisite: CSC 222 or CSC 306.

**CSC 311 Numerical Engineering Analysis (3)**

Introduction to computer analysis techniques used in solving electrical engineering problems. Capabilities and limitations of various software packages used in electrical engineering. Numerical analysis techniques applied to linear and nonlinear electrical systems. Review of Fortran 77 for scientific programming. 3 lectures. Prerequisite: CSC 101, MATH 242, EE 212.

**CSC 325 Operating System Control Languages (3)**

Control languages for various operating systems. Introduction to programming operating systems control languages. 3 lectures. Prerequisite: CSC 345.

**CSC 331 Numerical Linear Analysis (3)**

Introduction to methods currently available to engineers, scientists and mathematicians for dealing with systems of linear equations utilizing a digital computer. Solutions of systems of linear equations, calculation of matrix inverses, eigenvalues, and eigenvectors. Applications to problems in engineering and science. 3 lectures. Prerequisite: MATH 133 or 143 and ability to program in Fortran.

**CSC 332 Numerical Analysis I (3)**

Computer solutions of nonlinear equations and systems of linear equations. Numerical integration and solutions of ordinary differential equations. 3 lectures. Prerequisite: MATH 242, CSC 101.

**CSC 333 Numerical Analysis II (3)**

Continuation of numerical integration and differential equations. Spline and least-squares curve fitting techniques. 3 lectures. Prerequisite: CSC 332.

**CSC 340 Software Tools (3)**

Integrated software tools for developing and maintaining complex software systems. Introduction to system and program design methodologies. 3 lectures. Prerequisite: CSC 345.

**CSC 345 Data Structures (3)**

Basic data structures: arrays, records, simple linked structures, stacks, queues, linear lists, binary trees, sets and hashing. Abstract data types. Algorithms for internal sorting. Applications. 3 lectures. Prerequisite: CSC 118, CSC 245.

**CSC 346 File Structures (3)**

Principles of file organization. Sequential, indexed, hashed and tree organized files. Secondary indices. Data compression. Mass storage devices. File utilities. 3 lectures. Prerequisite: CSC 345.

**CSC 350 Discrete Dynamic Systems (3)**

Modeling, computer simulation and analysis of event-oriented dynamic systems involving random variables. Application of high level languages for discrete system simulation. Selected applications. 3 lectures. Prerequisite: CSC 118 or CSC 201, STAT 211 or STAT 321.

**CSC 351 Programming Languages I: Design (3)**

Comparison of structure and semantics of various high level programming languages. BNF grammars. Language implementation issues and techniques, including parameter passing, storage allocation and mapping and binding time. 3 lectures. Prerequisite: CSC 221, CSC 345.

**CSC 353 Computer Systems Programming (3)**

Design of assemblers, macroprocessors, and loaders. Advanced macrowriting and I/O programming. 3 lectures. Prerequisite: CSC 222, CSC 345.

**CSC 360 Continuous Dynamic Systems (3)**

Modeling, computer simulation and analysis of dynamic systems represented by ordinary differential equations. Applications of high level languages for continuous system simulation. Selected applications. 3 lectures. Prerequisite: CSC 201 and MATH 242.

**CSC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: Consent of department head.

**CSC 404 Telecommunications and Distributed Systems (3)**

Communications architectures and distributed systems; multicomputer complexes and interprocessor communications; communications media, message switching, and communications protocol standards. 3 lectures. Prerequisite: CSC 304, CSC 453 or consent of instructor.

**CSC 409 Microcomputer Systems (4)**

Continuation of CSC 309. Application programming, high level languages, and interfacing microprocessors. Introduction to 16-bit and 32-bit microprocessors. 3 lectures, 1 laboratory. Prerequisite: CSC 309.

**CSC 410 Computer Fundamentals for Educators (3)**

For students who plan to participate in the expanding role of computers in the field of education. Computer fundamentals, programming techniques, problem solving. Computers as teacher's aid and administrative tool. Program in BASIC. Credit not allowed for Computer Science majors. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**CSC 414 Computer Assisted Instruction (3)**

Techniques of utilizing the computer to assist individualized instruction. Comparison with other methods of programmed instruction. Hardware and software requirements for computer-based training. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

**CSC 416 Computer Applications in School Administration (3)**

Applications of computer techniques to data processing and other management applications in the administration of schools and school districts. 3 lectures. Prerequisite: CSC 410.

**CSC 419 Mathematical Programming (3)**

Extensions of linear programming, introduction to nonlinear programming, dynamic programming and dynamic optimization procedures with industrial applications. 3 lectures. Prerequisite: CSC 219 and MATH 133 or MATH 143.

**CSC 420 Artificial Intelligence Survey (3)**

Applications of artificial intelligence principles to computer processing of nonnumeric information. Machine understanding and translation of natural language text. Applications to cognitive processes problem-solving, science, medicine, and industrial robots. Use of list processing languages such as LISP and its extensions. 3 lectures. Prerequisite: CSC 345 and CSC 351.

**CSC 431 Numerical Analysis III (3)**

Numerical solutions of boundary value problems and partial differential equations. 3 lectures. Prerequisite: CSC 333.

**CSC 440 Computer Based System Development (3)**

Techniques for the production of computer based systems. Software tools, estimating techniques, project organization and control, documentation, and system specification for large programs. 3 lectures. Prerequisite: CSC 345.

**CSC 444 Health Information Systems (3)**

Their design, implementation, and applications including the evaluation of medical data as input to health care agencies' quality assurance systems for improving the quality of patient care and determining medical necessity. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

**CSC 446 Database Systems (3)**

Principles of database systems. Hierarchical, network, and relational approaches. Data description and accessing languages. Data security and privacy. Database administration. Applications to decision support systems. Selected case studies. 3 lectures. Prerequisite: CSC 346.

**CSC 450 Programming Languages II: Description and Analysis (3)**

Regular languages and finite automata. Lexical analysis and parsing functions of compilers. Context-free languages and pushdown automata. Continuation of CSC 351. 3 lectures. Prerequisite: CSC 351.

**CSC 451 Programming Languages III: Compiler Implementation (3)**

Intermediate translation forms. Run time representations. Generation of object code for compilers. Optimization. Register allocation. Continuation of CSC 450. 3 lectures. Prerequisite: CSC 450.

**CSC 453 Introduction to Operating Systems (3)**

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures. Prerequisite: CSC 304, CSC 346, CSC 353.

**CSC 454 Kernels and Real-Time Programming (4)**

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and real-time programming. 3 lectures, 1 laboratory. Prerequisite: CSC 404 and CSC 453.

**CSC 455 Computer Graphics (4)**

Applications for interactive graphic display systems and XY plotters. Design characteristics of graphical input/output systems. Experience in programming interactive graphic display systems. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

**CSC 461, 462 Senior Project (3) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time.

**CSC 463 Undergraduate Seminar (2) (CR/NC)**

Reports and discussions by students, based on their senior projects and on other topics relating to computer usage and programming which are of interest to persons preparing for a career in computer science. Offered only on a Credit/No Credit basis. 2 activity periods.

**CSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CSC 519 Computer Simulation I (4)**

Principles and organization of simulation software. Executive programs for interactive control of continuous, discrete and combined system simulations. Integration with real time input and output. Event scheduling. Function generation. Data collection. Graphical display of simulation results. 4 seminars. Prerequisite: CSC 350 and CSC 360.

**CSC 520 Computer Simulation II (4)**

Selected topics in computer simulation methodology and applications: peripheral processors. Micro and mini computers in simulation. Specialized languages. Computer system performance analysis. Concurrent programming methods. Management of simulation projects. 4 seminars. Prerequisite: CSC 519.

**CSC 531 Numerical Solution of Algebraic Systems (4)**

Direct and iterative methods for computing solutions to systems of equations; methods of finding eigenvalues and eigenvectors of a matrix; generalized eigenvalue problem; singular value decompositions. 4 lectures. Prerequisite: CSC 332, MATH 312.

**CSC 532 Numerical Solution of Differential Equations (4)**

High order predictor-corrector, Runge-Kutta, and extrapolation methods for initial value problems and stiff systems. Analysis of numerical stability, truncation error, and round-off error. 4 seminars. Prerequisite: CSC 333.

**CSC 541, 542 Advanced Database Topics (4)**

Recovery, integrity, concurrency, security, data models, distributed databases, database machines. 4 seminars. Prerequisite: CSC 446.

**CSC 551 Computer Systems and Software (4)**

Comparison of language features and compiler techniques for higher level languages. Predicate calculus. List and string processing languages. Compiler-compiler concept and implementation. Simulation languages. 4 seminars. Prerequisite: CSC 451.

**CSC 552 Computer Systems and Software (4)**

General concepts of computer architecture and operating systems. Design features of advanced computers, general time-sharing systems and schemes for dynamic memory allocation, scheduling and protection. Dynamic linkage between subroutines. Intercommunication between input/output and processors. 4 seminars. Prerequisite: CSC 453.

**CSC 559 Practicum in Computer Science I (1)**

Preliminary planning and feasibility studies for the practicum projects of CSC 560. 1 activity. Prerequisite: Consent of instructor.

**CSC 560 Practicum in Computer Science II (5)**

Documentation and solution of practical problems in computer science selected from business, industrial, and scientific organizations under guidance of lecturers from cooperating organizations and members of the computer science faculty. 1 seminar, 4 activities. Prerequisite: Consent of instructor.

**CSC 570 Selected Topics in Computer Science (1-3)**

Directed group study of selected topics for graduate students. Class schedule will list topic selected. Topic credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

**CSC 590 Seminar in Computer Science (3)**

Current problems and research in the field of computer science through discussions and selected readings. Group study of selected advanced topics. 3 seminars. Prerequisite: Graduate standing.

**CSC 599 Thesis/Project (4-6)**

Individual research or activity under faculty supervision leading to an acceptable thesis or project. Prerequisite: Graduate standing and consent of instructor.

## DFA—DIETETICS AND FOOD ADMINISTRATION

**DFA 121 Fundamentals of Food (4) (Also listed as HE 121)**

Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 three-hour laboratory. Prerequisite: CHEM 121.

**DFA 200 Special Problems for Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**DFA 210 Nutrition (3) (Also listed as HE 210)**

GEB E.2.

Nutritional needs throughout the life cycle. Chemical composition of foods and their utilization in the body. 3 lectures.

**DFA 226 Home Food Conservation (2) (Also listed as HE 226)**

Conservation techniques to obtain maximum control of food quality with most efficient use of time, energy, and economic resources. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 two-hour laboratory. Prerequisite: DFA 121.

**DFA 310 Maternal and Child Nutrition (3) (Also listed as HE 310)**

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: DFA 210.

**DFA 321 Meal Management (3) (Also listed as HE 321)**

Factors and principles involved in the choice, purchase, and preparation of foods for a meal. Application of management principle in the use of time, energy, and money in relation to feeding the family. Planning, preparing, and serving meals with emphasis on nutritional, aesthetic, economic, and cultural aspects of food. 1 lecture, 2 two-hour laboratories. Prerequisite: DFA 121, DFA 210, HE 122.

**DFA 328 Advanced Nutrition (4)**

Human nutritional requirements. Factors affecting requirements. Biochemical and physiological functions of nutrients and their interactions in the body. Evaluation of nutritional status. Topics in nutrition research. 4 lectures. Prerequisite: DFA 210, CHEM 328, ZOO 239.

**DFA 348 Experimental Nutrition (2)**

Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 three-hour laboratories. Prerequisite: DFA 328 or consent of instructor.

**DFA 400 Special Problems for Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing and consent of instructor.

**DFA 415 Methods of Teaching Nutrition (3) (Also listed as HE 415)**

Identification of nutrition learning needs and problems at various stages of the life cycle. Selection of valid content and learning activities for a variety of teaching situations and strategies in community, classroom, and clinic. 3 lectures. Prerequisite: DFA 328, ED 305, and senior standing.

**DFA 416 Community Nutrition (3)**

Problems inherent in improvement of nutrition at the community level. Relation to local, state, and national nutritional programs. Role of the nutritionist in public health, social welfare, agricultural extension, and school lunch program. 2 lectures, 1 two-hour laboratory. Prerequisite: DFA 415.

**DFA 421 Cultural and Aesthetic Aspects of Food (3) (Also listed as HE 421)**

Psychological, sociological, and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 three-hour laboratory. Prerequisite: DFA 321 or consent of instructor.

**DFA 425 Quantity Food Preparation (3)**

Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 1 lecture, 2 two-hour laboratories. Prerequisite: DFA 321, senior standing, or consent of instructor.

**DFA 426 Food Systems Management (3)**

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Advance reservation with instructor required. 3 lectures. Prerequisite: DFA 321, senior standing, or consent of instructor.

**DFA 427 Equipment and Layout (3)**

Selection, maintenance, and arrangement of equipment and furnishings for food service departments with emphasis on materials, construction, and specifications. Designated field trips required. 2 lectures, 1 three-hour laboratory. Prerequisite: Senior standing or consent of instructor.

**DFA 429 Diet Therapy (4)**

Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 3 lectures, 1 two-hour laboratory. Prerequisite: DFA 348.



**DFA 440 Internship (1-12) (CR/NC)**

Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading. Prerequisite: Junior standing and consent of instructor.

**DFA 461, 462 Senior Project (3) (3)**

Selection and completion of research related to the students area of interest. Project requires a formal report which must follow departmental guidelines. Minimum of 180 hour required. Prerequisite: ENGL 215 or ENGL 218 required. Completion of 135 quarter units including all freshman, sophomore, and junior classes in area of study.

**DFA 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**DFA 471 Selected Advanced Laboratory (1-3)**

Directed laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. One 3-hour laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**DH—DAIRY HUSBANDRY****DH 101 Dairy Feeds and Feeding (2)**

Identification and classification of feeds; simple use of food nutrients, protein, fat, and carbohydrates; methods of preparing feeds; relative values of common feeds for each class of livestock with special attention to dairy cattle, the use of byproduct feeds. 2 lectures.

**DH 102 Feeding Dairy Cattle (2)**

Balancing dairy cattle rations. Feeding practices and nutritional requirements. 2 lectures. Prerequisite: DH 101, MATH 102.

**DH 121 Elements of Dairying (4)**

General information on statistics and opportunities in the dairy industry. Composition and food value of dairy products. Common tests to determine quality of products. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

**DH 133 Fitting and Showing Dairy Cattle (2)**

Selection, preparation, presentation of dairy cattle for shows, sales, and photographing. 1 lecture, 1 laboratory.

**DH 142 Dairy Cattle Selection (2)**

Selection of dairy cattle with consideration to breed characteristics and conformation. Evaluation of type characteristics. Correlation between type and production. 2 laboratories.

**DH 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**DH 221 Milk Production (4)**

Factors affecting milk production. Dairy production problems and methods. Practice in many of the frequently used dairy production skills. 3 lectures, 1 laboratory. Prerequisite: DH 102, DH 121, DH 142.

**DH 222 Commercial Dairy Herd Management (4)**

Commercial dairy practices from the standpoint of cost of feeding and management. Visits are made to successful dairy farms. 3 lectures, 1 laboratory. Prerequisite: DH 221.

**DH 230 General Dairy Husbandry (4)**

GEB F.2.

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Course for other than dairy majors. 3 lectures, 1 laboratory.

**DH 233 Advanced Dairy Cattle Selection (2)**

Advanced practice in the comparative evaluation of dairy cattle. Detailed scoring and classifying cattle on conformation. Functional anatomy and relationship to production. Visits to breeding establishments and shows. 1 lecture, 1 laboratory. Prerequisite: DH 142.

**DH 301 Advanced Dairy Cattle Feeding (3)**

Nutrition requirements of dairy cattle. Successful, economical feeding practices, ration formulation utilizing the computer and desk calculators. 2 lectures, 1 activity. Prerequisite: DH 102 or ASCI 101 and computer literacy elective.

**DH 323 Breeds, Pedigrees and Management of Dairy Cattle (4)**

Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. Practice in compiling pedigrees. Methods and problems in establishing and managing a purebred dairy herd. 3 lectures, 1 laboratory. Prerequisite: DH 221, DH 222.

**DH 330 Artificial Insemination (2)**

Techniques in the collection, evaluation and processing, storage of semen. Insemination procedures. Fertility problems. Record keeping. Endocrine control of reproduction. Embryo transfer. 1 lecture, 1 laboratory. Prerequisite: DH 121 or ASCI 121, VS 123 or VS 099.

**DH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**DH 422 Breeding and Selection of Dairy Cattle (4)**

Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 3 lectures, 1 laboratory. Prerequisite: BIO 303, DH 142.

**DH 432 Advanced Dairy Herd Management (4)**

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, feeding and nutrition, herd health, milk secretion, reproduction, mating and selection. 3 lectures, 1 laboratory. Prerequisite: DH 301, DH 323, DH 330, and DH 422.

**DH 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**DH 463 Undergraduate Seminar (2)**

Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 lectures.

**DH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## DM—DAIRY MANUFACTURING

### DM 132 Frozen Dairy Foods (4)

Selection of ingredients, calculating, and processing ice cream, ice milk, and sherbet mixes. Equipment and methods required to process, freeze, package, and harden ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DH 121.

### DM 133 Milk Processing and Merchandising (4)

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. Product promotion, advertising and merchandising. 3 lectures, 1 laboratory. Prerequisite: DH 121.

### DM 212 Dairy Processing Technology (4)

Equipment and technology involved in manufactured dairy products, including butter, cheeses, ice cream, yogurt and concentrated dairy foods. 3 lectures, 1 laboratory. Prerequisite: DM 133.

### DM 220 Dairy Product Consumer Education (2)

Consumer education in identification, selection, and nutritional value of dairy products. Comparison of dairy products with substitutes and imitations. Uses of dairy products in diets and home meal planning. Caloric values, chemical composition, and constituents of dairy products. 1 lecture, 1 activity.

### DM 230 General Dairy Manufacturing (4)

GEB F.2.

Composition and properties of fluid milk and manufactured milk products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. Elective course for nondairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

### DM 233 Dairy Foods Evaluation (2)

Basic principles of sensory examination of dairy foods. Physiology of the various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory. Prerequisite: DM 133.

### DM 326 Fermented Dairy Foods (3)

Methods, ingredients, and equipment used in the manufacture of fermented dairy products, such as sour cream, buttermilk, and yogurt. Plant practice and field trips to study commercial applications. 2 lectures, 1 laboratory. Prerequisite: BACT 221.

### DM 331 Condensed and Dry Milk (4)

Processing, packaging, and marketing of evaporated and condensed milk and dry milk powders. Field trips are made to study commercial plants, methods and equipment. Mojonnier analysis and other routine tests. 3 lectures, 1 laboratory. Prerequisite: DM 132, DM 133.

### DM 332 Dairy Inspection (3)

California dairy codes and score cards used for dairy plants and farms. Quality tests of dairy products. Practice in inspecting and scoring dairy farms and factories. Organizational structure of inspection services. 2 lectures, 1 laboratory. Prerequisite: DM 133, BACT 221.

### DM 334 Cheese (4)

Equipment and methods needed to manufacture, package, cure and market various types of cheese. Practice in the university creamery. 3 lectures, 1 laboratory. Prerequisite: Bact 221, DM 133.

### DM 336 Butter and Dairy Spreads (4)

Equipment, ingredients, and methods needed to handle and manufacture various creams, butter, oleomargarine, and other dairy spreads. Practice in university creamery and field trips to observe commercial applications. 3 lectures, 1 laboratory. Prerequisite: DM 133.

**DM 433 Dairy Plant Management and Equipment (4)** ..

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant location, design facilities and layout. Survey of financing applied to the dairy industry. Maintenance and operation of the equipment. 3 lectures, 1 laboratory. Prerequisite: PHYS 121 and consent of instructor.

**ECON—ECONOMICS****ECON 105 Consumer Economics (3)**

Consumer-producer relationships, money management, buying methods; investments, insurance, and housing; agencies that help the consumer. 3 lectures.

**ECON 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ECON 201 Survey of Economics (3)****GEB D.3.**

Basic material covered in Principles of Economics, ECON 211, 212 in a less detailed and technical manner. For majors requiring one quarter of economics. Not open to students with previous credit in ECON 211 or 212 or equivalent. 3 lectures. Prerequisite: Sophomore standing. Successful completion of ENGL 114 recommended.

**ECON 211 Principles of Economics (3)****GEB D.3.**

Macroeconomics: principles and applications in the theory of national income, output and employment. Determination and measurement of the national product; inflation; money, banking, monetary and fiscal policies. Not open to majors in Economics and Business. 3 lectures. Prerequisite: Sophomore standing. Successful completion of ENGL 114 recommended.

**ECON 212 Principles of Economics (3)**

Microeconomics: principles and applications in the theory of producer and consumer behavior, and the distribution of factor income with focus on the output market. Effect on the national economy. Not open to majors in Economics and Business. 3 lectures. Prerequisite: ECON 211 or consent of instructor.

**ECON 213 Principles of Economics (3)**

Principles and applications in macro and microeconomics; growth and development, comparative economic systems, international trade and current economic problems. 3 lectures. Prerequisite: ECON 211 and ECON 212 or equivalent.

**ECON 221 Microeconomics (4)**

Rigorous examination of microeconomic analysis. Marginal analysis as related to consumer, producer, and factor behavior in determination of prices and output. An in-depth study of microeconomic principles. Not open to students with credit in ECON 212 or equivalent. 4 lectures. Prerequisite: Sophomore standing. Successful completion of freshman mathematics and ENGL 114 recommended.

**ECON 222 Macroeconomics (4)****GEB D.3.**

Rigorous examination of macroeconomic analysis. Aggregate output, employment, prices, and economic policies for changing these variables. An in-depth study of macroeconomic principles. Not open to students with credit in ECON 211 or equivalent. 4 lectures. Prerequisite: ECON 221 and sophomore standing. Successful completion of freshman mathematics and ENGL 114 recommended.

**ECON 301 Introduction to Managerial Economics (3)**

Fundamental principles and analytical tools of economics useful in business decision making; applications to management through case study of actual business and managerial situations. 3 lectures. Prerequisite: ECON 212 or ECON 221 or consent of instructor.

**ECON 304 Comparative Economic Systems (3)**

GEB D.4.b.

Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 306 Applied Forecasting (4)**

Causes and measurement of business fluctuations. Techniques of forecasting. 4 lectures. Prerequisite: One course in principles of economics.

**ECON 311, 312 Intermediate Microeconomics (4) (4)**

Economics of prices and markets. Demand and supply. Returns and costs, factor pricing and income distribution, welfare and economic progress. 4 lectures. Prerequisite: One course in principles of microeconomics; MATH 221, MATH 222 or equivalent; STAT 251, STAT 252 or equivalent.

**ECON 313 Intermediate Macroeconomics (4)**

Economic activity related to production and resource use to meet goals of society. Income, employment, economic growth and progress of the United States and its regions. 4 lectures. Prerequisite: One course in principles of macroeconomics; MATH 221, MATH 222 or equivalent; STAT 251, STAT 252 or equivalent; ECON 337.

**ECON 314 Monetary and Fiscal Policies (4)**

National economic fluctuation models and related corrective monetary and fiscal policies on income, employment, output, growth and prices. 4 lectures. Prerequisite: ECON 313.

**ECON 317 Development of Economic Analysis (3)**

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 3 lectures. Prerequisite: Junior standing and satisfactory completion of ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

**ECON 323 European Economic History (3)**

Analysis of the growth and development of economic institutions in the European economies from about 1600 to present. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 324 American Economic History (3)**

Topical economic analysis of major events and institutions of American economic history as viewed against their causes, origin and development. Economic development of America from an underdeveloped nation. Agriculture, transportation, monetary and banking policies, business, labor, and growth of governmental activities. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 325 Underdevelopment and Economic Growth (3)**

GEB D.4.b.

Economic development: the less developed world and the American interest. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 330 Economics of Energy and Resources (3)**

Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. 3 lectures. Prerequisite: One course in principles of economics or consent of instructor.

**ECON 337 Money, Banking and Credit (4)**

Principles and practices of monetary, banking, and credit institutions as applied to business activity and public policy. 4 lectures. Prerequisite: One course in principles of macro-economics.

## 350 ECON

### ECON 339, 340 Econometrics (4) (4)

Application of statistical methods useful in economics. The general linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. 4 lectures. Prerequisite: STAT 322, MATH 132 or MATH 143 or MATH 221, or consent of instructor.

### ECON 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### ECON 401 International Trade (4)

Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

### ECON 402 Public Finance (4)

Principles of government financing and its various economic and social effects: collecting, spending and administration of public funds, particularly at state and local levels. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

### ECON 403 Industrial Organization (4)

Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures. Prerequisite: ECON 212, or ECON 221 or consent of instructor.

### ECON 404 International Monetary Economics (4)

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

### ECON 410 Cost-Benefit Analysis (4)

Principles of rational decision making with respect to business and government spending. Measurement of costs and benefits, interest rates, and criterion selection. 4 lectures. Prerequisite: ECON 221 or ECON 212; ECON 311, ECON 312 recommended.

### ECON 413 Labor Economics (4)

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures. Prerequisite: ECON 212 or ECON 221 or consent of instructor.

### ECON 430 Internship (2-8) (CR/NC)

Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the department head. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading. Prerequisite: Junior standing.

### ECON 433 Transportation Economics (4)

Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 4 lectures. Prerequisite: One course in principles of economics.

**ECON 434 Urban Economics (4)**

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: One course in principles of economics.

**ECON 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**ECON 463 Undergraduate Seminar (2)**

Seminar in applications of economic theory with emphasis on current problems. 2 seminars. Prerequisite: ECON 462.

**ECON 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**ECON 500 Independent Study (1-3)**

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

**ED—EDUCATION****ED 104 Introduction to Art Materials (3) (Also listed as ART 104)**

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

**ED 125 Efficient Reading (2) (CR/NC)**

Development of reading efficiency required in modern business, industry, and the professions. Credit/No Credit grading only. 1 lecture, 1 activity. Repeatable to a maximum of 4 units.

**ED 160 Personal Assessment I (2) (CR/NC)**

Introduce, demonstrate, and apply techniques that will enable students to develop practical study skills, investigate and assess academic, career, and personal goals, and improve cognitive processes. Credit/No Credit grading only. 2 lectures.

**ED 161 Personal Assessment II (2) (CR/NC)**

Expand the use of analytical thought, feelings, and creative imagery to explore the personal development of educational and career objectives. Resumé writing skills, interview skills workshops and mock interviews. Clarification of career/academic goals. Major-related internships and/or summer employment opportunities. Credit/No Credit grading only. 2 lectures. Prerequisite: ED 160.

**ED 301 Multicultural Education in Elementary School (3)**

Multicultural elements which influence learning and learning styles and the academic and social environment of the elementary school; examination of curricular materials in social studies and other subject matter areas. 2 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

**ED 302 Multicultural Education in the Secondary School (3)**

Multicultural elements which influence the academic and social environment of the American secondary school; professional responsibilities and legal requirements; review of successful programs aimed at relieving tension created by cultural differences in rural and urban settings. 2 lectures, 1 activity.

**ED 305 Teaching and Learning Processes (3)**

Learning processes: selected theories of learning related to teaching; theories of human development and learning; psychological principles involved in the teaching-learning event; self-evaluation of the prospective teacher. 3 lectures.

**ED 322 Community Laboratory (1-3)**

Supervised learning experiences in cooperation with youth club activities, educational and community agencies. Application of knowledge and skills acquired in college classrooms. 1-3 activities. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**ED 400 Special Problems for Undergraduates (1-3)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior or senior standing and consent of instructor.

**ED 401 Reading Methods in the Elementary School (3)**

Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the elementary classroom. 3 seminars. Prerequisite: Advanced standing.

**ED 402 Field Experience in Elementary School Reading (3)**

Supervised field experience in the teaching of reading in a school setting. Seminars relating to case studies, observations and participation. 1 lecture, 2 activities. Prerequisite: ED 401.

**ED 403 Reading Methods in the Secondary School (3)**

Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the classroom. 3 lectures. Prerequisite: Advanced standing.

**ED 404 Field Experience in Secondary School Reading (3)**

Supervised field experience in the teaching of reading in a secondary school setting. Seminars relating to case studies, observations and participation. 1 lecture, 2 activities. Prerequisite: ED 403.

**ED 405 Diagnosis, Prescription and Evaluation (2)**

Diagnosis of student learning problems. Prescription and direction of student learning programs. Evaluation of student achievement. 1 seminar, 1 activity.

**ED 406 Teaching the Adolescent (3)**

An exploration of factors relating to social and personal characteristics of the developing adolescent in the school. 3 seminars. Prerequisite: A course in introductory psychology or a course in adolescent development.

**ED 407 Teaching Language Arts in the Elementary School (3)**

Selection, organization and presentation of lessons in all areas of language arts communication, integration of other curriculum areas and language arts; cultural factors which influence language acquisition and learning English as a second language. 2 lectures, 1 activity.

**ED 408 Teaching Science and Social Studies in the Elementary School (3)**

Curriculum and methods in teaching science and social studies; selecting materials, organizing programs. 2 lectures, 1 activity.

**ED 409 Teaching in the Secondary School (3)**

Principles of effective teaching; instructional planning and related management techniques. 2 seminars, 1 activity. Taken immediately prior to preliminary student teaching.

**ED 410 Preliminary Student Teaching (6)**

Part-time assignment in a classroom; includes teaching activities under the direction of a selected master teacher in consultation with a university supervisor; assignment consists of an entire morning in the classroom (or the equivalent). Prerequisite: Completion of courses and requirements to preliminary student teaching and approval of campus screening committee for credential candidates.

**ED 411 Organization and Management in the Elementary School (3)**

Principles of motivation and discipline; classroom organization and management; daily, weekly and yearly planning for instruction; teaching styles. 2 seminars, 1 activity.



**ED 420 Student Teaching (12)**

Full-time assignment in a classroom; includes teaching activities under the direction of a selected master teacher in consultation with a university supervisor; assignment consists of an entire teaching day in the school for one quarter. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

**ED 421 Senior Project—Practicum (Multiple Subjects) (2)**

Emphasis on solving problems related to field experience, refining of organizational and instructional strategies, including interdisciplinary approach to curriculum; preparation for a job search; professional responsibilities and legal requirements; and development of a senior project on an education related topic. 2 seminars. Must be taken concurrently with ED 420 student teaching.

**ED 422 Student Teaching Practicum (Single Subjects) (3)**

Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

**ED 440 Introduction to the Exceptional Individual (3)**

Characteristics of individuals with exceptional needs, implications for education; legal basis of educational adjustments; related current problems, trends, programs and community resources. 3 lectures.

**ED 441 Mainstreaming Strategies for Classroom Teachers (3)**

Procedures to enable the classroom teacher to respond appropriately to the exceptional child within the context of the total classroom. Includes assessment, IEP's, modification of curriculum and classroom management. 3 seminars. Prerequisite: ED 440.

**ED 442 Administration: Exceptional Students and Services (3)**

Principles and practices of organizing and administering special education programs; assessment and placement procedures appropriate to the individual exceptional child. 3 seminars.

**ED 449 Supervised School Experience (3-6) (CR/NC)**

Supervised observation and participation six to twelve hours per week in cooperating schools. Tasks to acquaint the student with appropriate responsibilities of public school teachers. Credit/No Credit grading only.

**ED 450 Classroom Management Strategies (3)**

Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. 3 lectures. Prerequisite: Student teaching.

**ED 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ED 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate major adviser, and supervising faculty member.

**ED 501 Problems and Practices in Curriculum Development (3)**

Planning and development of a comprehensive curriculum project geared to individual needs and interests. Emphasis on practicality. 3 seminars. Prerequisite: ED 515 or consent of instructor.

**ED 502 Early Elementary Curriculum and Methods (3)**

Objectives, methods and curriculum for the primary grades. Analysis of research and theory which give direction for teaching young children. Construction of instructional aids. 2 seminars, 1 activity. Prerequisite: Teaching experience.

**ED 503 Seminar in Language Arts Curriculum and Methods (3)**

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends. 3 seminars. Prerequisite: Valid teaching credential.

**ED 504 Seminar in Science Curriculum and Methods (3)**

Science curriculum: objectives, methods, content, materials, evaluation, current trends, and science program assessments. 3 seminars. Prerequisite: Valid teaching credential.

**ED 505 Seminar in Social Studies Curriculum and Methods (3)**

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends. 3 seminars. Prerequisite: Teaching experience.

**ED 506 Models of Instruction (3)**

Analysis of a wide variety of approaches to teaching that guide instruction in the classroom and in other educational settings. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 507 Instructional Materials (3)**

Provides the theoretical basis to examine, evaluate and integrate commercial and teacher-made supplemental materials into a standard curriculum. Develops the ability to construct teacher-made materials. Develops the ability to apply research techniques in evaluating the effectiveness of instructional materials. 3 seminars. Prerequisite: ED 585 or ED 582.

**ED 510 School Finance and Business Management (3)**

Financial administration of public schools in California. Principles of school support, sources and methods of apportioning funds to school districts. Development of budgets; implications for educational needs at the district, school and classroom levels. 3 lectures.

**ED 511 School Law (3)**

Legal aspects of school administration, including principles embodied in constitutional, statutory and administrative law, common law, and court decisions with implications for administration and operation of public schools in California. 3 lectures.

**ED 512 School Administration (3)**

Principles and practices of organizing and administering elementary and secondary schools, including leadership, decision-making processes, human relations, instructional problems, special services, school plant management, educational planning for change, and staff development. 3 lectures.

**ED 513 Federal, State, County, and District School Administration (3)**

Overview of public education in relation to the formal organization and administration at federal, state, intermediate and local district levels, and the influences upon education exerted by political, social, economic and religious groups and organizations. 3 lectures.

**ED 514 Staff Administrator Relationships (3)**

Principles and practices of personnel administration in school systems: recruitment and selection of personnel; job descriptions and role expectancies; job rewards, benefits, and incentives; rules, regulations, and policies; negotiations and grievance procedures; formal and informal communications; professional ethics and codes of behavior. 3 lectures.

**ED 515 Curriculum Development (3)**

Strategies for curriculum development in elementary and secondary schools: curriculum models, rationales, innovations and trends; leadership for curriculum study; curriculum design and instructional strategies; and assessing effects of curriculum and instructional change upon learning. 3 lectures.

**ED 516 Supervision of Instruction (3)**

Principles and techniques of educational leadership in improving teacher-learner relationships in elementary and secondary schools; organizing, equipping and staffing classes; communicating with individuals and groups; in-service education programs and activities; curriculum development and implementation; and program and staff evaluation. 3 lectures.

**ED 517 School-Community Relationships (3)**

Strategies for interaction between educational institutions and their respective publics. Establishing working relationships with other educational institutions, parents and neighborhoods, and with the community. 3 lectures.

**ED 518 Administrative Services Field Work (3-6)**

Supervised field work in school administration at the elementary or secondary level; specific assignments made to cover important elements of school administration. Repeatable to maximum of 15 units. Prerequisite: Consent of instructor.

**ED 525 Reading Process (3)**

Physiological, psychological and psycholinguistic components of the reading process. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 404.

**ED 526 Diagnosing Reading Problems (3)**

Formal and informal methods of diagnosing reading problems in classrooms and reading clinics. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 405 or consent of instructor.

**ED 527 Remediation of Reading Problems (3)**

Interpreting diagnostic results and prescribing remediation for specific reading problems within classrooms and special reading centers. 3 lectures. Prerequisite: ED 526.

**ED 528 Reading Programs (3)**

School reading programs and classroom organization. Application of research findings to teaching reading. Survey of innovative programs in elementary and secondary school reading. For teachers and supervisors. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 405 or consent of instructor.

**ED 529 Teaching Reading to Bilingual Students (3)**

Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual student. 3 seminars. Prerequisite: ED 401 or ED 403.

**ED 530 Teaching Reading in the Secondary Schools (3)**

Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through 12. 3 lectures. Prerequisite: ED 403, ED 404 or consent of instructor.

**ED 531 Supervision of Reading (3)**

Acquisition and application of the principles of supervision in a field setting by organizing, equipping and staffing classes; communicating with individuals and others employed in teaching reading; provide inservice programs and develop reading curriculum. 1 seminar, 2 activities. Prerequisite: ED 526, ED 527, ED 534 or consent of instructor.

**ED 532 Reading Field Work (3-6)**

Practical application of reading services in actual school classrooms, with assignments arranged to work within the setting of a school reading specialist. Weekly seminars with university staff included. Prerequisite: ED 526, ED 527, ED 534 or consent of instructor.

**ED 533 College and Adult Reading Practices (3)**

Supervised field experiences/activity in teaching reading to adults and college students in a college setting. Seminars relating to instructional procedures. 2 seminars, 1 activity. Prerequisite: ED 526, ED 527 or consent of instructor.

**ED 534 Advanced Clinical Experience in Reading (3-6)**

Supervised diagnosis and treatment of reading disability cases referred to the University by counselors, parents, teachers, and pupils themselves. Weekly interviews with school students, and seminars for discussion and analysis of current cases. Prerequisite: ED 526 and consent of instructor.

**ED 540 Guidance Services for Exceptional Students (3)**

Fundamental guidance techniques for teachers working with exceptional individuals and their families; problems affecting the personal, educational and social adjustment of individuals with exceptional needs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

**ED 541 Resource Specialist (3) (3)**

Consulting functions. Coordinating functions. Development of skills to provide consultive services to teachers, administrators, and parents of handicapped; instructional strategies, curricular modification, utilization of community resources. Legislation and regulations, coordination skills, implementation of the IEP, instructional programs. 2 seminars, 1 activity. Prerequisite: Acceptance into Special Education Program or valid Special Education Credential.

**ED 545 Teaching Strategies for the Learning Handicapped (3)**

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the learning handicapped student. 3 seminars. Prerequisite: ED 440 and admission to Special Education Program, or consent of instructor.

**ED 546 Teaching Strategies for the Severely Handicapped (3)**

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: ED 440.

**ED 547 Atypical Learning Patterns (3)**

Theoretical considerations of learning patterns deviating from normal development. Educational implications of the integrative function of motor, sensory and perceptual abilities of learning disabled individuals. 3 seminars. Prerequisite: ED 440 and ED 545.

**ED 548 Career Development of Exceptional Persons (3)**

Career selection, preparation and social adjustment, community attitudes and legal requirements for individuals with handicapping conditions. Observation and field work required. 2 seminars, 1 activity. Prerequisite: ED 440 or consent of instructor.

**ED 550 Assessment of the Exceptional Student (3)**

Use of standardized tests and other assessment devices for the identification of learning and behavioral patterns of exceptional pupils. Includes assessments of physical, intellectual, social and emotional behavior. 3 seminars. Prerequisite: Advanced standing.

**ED 551 Characteristics of the Severely Handicapped (3)**

Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: ED 440.

**ED 553 Current Issues in Special Education (3)**

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

**ED 554 Advanced Practicum in Special Education (1-12)**

Directed teaching activities with students with exceptional needs in public school programs, integrating and demonstrating competencies of candidates for the Specialist Credential. Scheduled seminars. Prerequisite: Admission to Special Education Specialist Credential Program, ED 540, ED 545, ED 547, ED 550.

**ED 555 Introduction to Counseling (3)**

Overview of the counseling profession, underlying philosophical and theoretical concepts and ethics. Emphasis on developing communication skills. 3 seminars. Prerequisite: Graduate standing.

**ED 556 Minority Counseling (3)**

Socio-psychological concepts of the visible ethnic experience. Effects of poverty and the significance of oppression. Counseling and guidance techniques, parent involvement, and community relations. 3 seminars. Prerequisite: ED 555, PSY 454.

**ED 557 Career/Community Resource Utilization (3)**

Counselor role in information dissemination, and as a community resource and referral agent. Includes sources of occupational/educational information, computerized retrieval systems, career choice theory and career counseling. 3 seminars. Prerequisite: Graduate standing.

**ED 558 Appraising Career Development (3)**

Appraisal procedures and theory in career guidance and counseling. Synthesis of personal and social data to diagnose and predict career development and choice. 3 seminars. Prerequisite: Graduate standing.

**ED 559 Career Education (3)**

Curriculum and purpose of career education in elementary and secondary schools and higher education. 3 seminars.

**ED 560 Counseling Theories (3)**

Variety of theoretical concepts in counseling as applied to an individual's personal, educational and career needs. 3 seminars. Prerequisite: ED 555, PSY 307.

**ED 561 Group Guidance and Counseling (3)**

Principles of group counseling, theories, ethics, research and evaluation with emphasis on communication skills, process, development and task orientation. 3 seminars. Prerequisite: ED 555.

**ED 562 Student Development—Higher Education (3)**

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. 3 seminars. Prerequisite: Graduate standing.

**ED 563 Student Affairs in Higher Education (3)**

Explores current issues and trends in higher education, historical and organizational framework and implications for student development. 3 seminars. Prerequisite: Graduate standing.

**ED 564 Consultation, Ethics and the Law (3)**

Program and staff development needs assessments, program development and evaluation. Consultation and organizational development models and skills. Ethics, client rights and laws related to counseling. 3 seminars. Prerequisite: ED 555.

**ED 566 Advanced Group Counseling (3)**

Application of counseling theory, therapeutic intervention, ethics, leadership and principles to specific developmental and process groups. 2 seminars, 1 activity. Prerequisite: ED 555 and ED 561. May take ED 560 concurrently.

**ED 567 Counseling the Elderly (3)**

Understanding of the dynamics of old age as applied to counseling. Includes the application of physiological, informational, psychological, crisis and non-white concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: ED 555, and PSY 459 or CFD 425.

**ED 568 Cognitive Behavioral Counseling (3)**

Theory and application of cognitive restructuring approaches in counseling. Includes cognitive learning approaches, coping, problem solving and decision making skills. 3 seminars. Prerequisite: ED 555, ED 560 and PSY 455.

**ED 569 Practicum in Counseling (3)**

Counseling experience under direct supervision in the Counseling and Guidance Clinic. Emphasis on integration of information and theory with applied counseling techniques and strategies. Weekly seminars with staff. Prerequisite: ED 555.

**ED 570 Nonsexist and Relationship Counseling (3)**

Review of anthropological, social and psychological antecedents to sex role stereotyped expectations, implications for education, career, relationships and parenting. Effective developmental strategies to prevent stereotyping. Non-sexist counseling strategies and interventions for counseling troubled relationships. 3 lectures. Prerequisite: ED 555, CFD 450.

**ED 571 Advanced Marriage, Family and Child Counseling (3)**

Application of the theories of marriage, family and child counseling. Informal and formal assessment, psychodynamic, structural and communications counseling, sexual concerns, ethics and law. 3 lectures. Prerequisite: CFD 450, ED 555.

**ED 572 Child Counseling and Therapy (3)**

Assessment, diagnosis, treatment planning, evaluation and documentation of case studies of children with emphasis on developmentally appropriate individual and group interventions. Effective parenting strategies will be reviewed. 3 seminars. Prerequisite: ED 555, PSY 307, PSY 456.

**ED 573 Field Experience, Counseling (3-12)**

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Prerequisite: Consent of counseling coordination one quarter prior to enrollment.

**ED 581 Graduate Seminar in Education (1-3)**

Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

**ED 582 Investigative Techniques (3)**

Principles and methods of applying appropriate designs and statistical analysis to research in counseling and education. 3 lectures. Prerequisite: College level mathematics.

**ED 585 Research Methods in Education (3)**

Develop the student's ability to compare and contrast a variety of educational research methods, and to implement a project which demonstrates the student's knowledge of research methodology. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 586 Group Processes in Education (3)**

Task-oriented groups in educational and community settings. Personal development, leadership and membership roles, values and decision-making productivity models and strategies. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 587 Educational Psychology (3)**

Understanding the learning environments which will accommodate the range of learners in the schools. Combining process, concepts, theories, materials, and media in order to promote motivation and achievement. 3 lectures. Prerequisite: ED 305, equivalent course, Master's degree candidate or consent of instructor.

**ED 588 Cultures, Communities, and Education (3)**

Historical analysis of the many socio-economic, cultural, and politico-judicial traditions influencing present educational conditions in America. A trans-disciplinary perspective of the pluralistic society in both metropolitan and rural environments. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 599 Thesis or Project (3) (3)**

Completion of a thesis or project pertinent to the field of education. Prerequisite: Consent of graduate committee and supervising faculty member(s).

## EDES—ENVIRONMENTAL DESIGN

### EDES 101 Introduction to Architecture and Environmental Design (2) (CR/NC)

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the school's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

### EDES 110 Descriptive Drawing (1)

Exercises in drawing without mechanical aids. Total credit limited to 3 units. 1 laboratory.

### EDES 111 Introduction to Drawing and Perspective (3)

Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

### EDES 112 Basic Graphics (3)

Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: EDES 110, EDES 111, or consent of instructor.

### EDES 113 Graphics (6)

Covers material in EDES 111 and 112. Primarily for transfer students. Partial credit may be granted. 6 laboratories.

### EDES 201, 202 Environmental Design Fundamentals (3) (3)

Elements of visual perception. Theories of environmental design. Program development. Analytic techniques and problem solving methodologies. Behavioral and social implications of environmental design decisions. Projects in the environmental context. 3 laboratories. Prerequisite: EDES 101, EDES 112.

### EDES 210 Advanced Descriptive Drawing (2)

Advanced programs in descriptive drawing as continuation of EDES 110. 2 laboratories.

### EDES 250 Computer Applications (2)

GEB F.1.

Introduction to the application of computers in architecture. 1 lecture, 1 laboratory.

### EDES 251 Digital Computer Applications (1)

Introduction to the application of computers in architecture. 1 lecture.

### EDES 301 Environmental Impact Reporting (3)

Systematic and interdisciplinary methodologies for information handling and transfer for decision making in environmental development. Public concerns, participation and legal implications. Problem areas. 3 lectures. Prerequisite: Third-year standing.

### EDES 303 Human Factors for Environmental Designers (3)

Integrated approach to development of systematic design programs. Developing and interpreting human factors design criteria, performance and satisfaction as a function of environmental factors, determining and assessing user preferences, methods of field observation and analysis. 3 lectures. Prerequisite: Second-year standing in School of Architecture and Environmental Design or consent of instructor.

**EE—ELECTRICAL ENGINEERING****EE 110 Orientation (1)**

Familiarization with the field of electrical and electronic engineering. 1 lecture.

**EE 112 Basic Circuit Analysis (2)**

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems, op-amp circuits. 2 lectures. Prerequisite: MATH 142 or equivalent.

**EE 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**EE 201 Electric Circuit Theory (3)**

Application of fundamental circuit laws and theorems to the analysis of dc, and steady-state single-phase and three-phase circuits. For engineering majors except electronic/electrical. 3 lectures. Prerequisite: MATH 242, PHYS 133.

**EE 211, 212 Basic Electric Circuit Analysis (3) (3)**

Continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, phasors, ac power, 3-phase circuits, forced and natural response, transient and steady-state analysis, complex frequency and magnetically coupled circuits. 3 lectures. Prerequisite: MATH 143 and EE 112 for EE 211; MATH 242 (or concurrent) and EE 211 for EE 212.

**EE 241, 242 Basic Circuits Laboratory (1) (1)**

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Concurrent or prerequisite: EE 211, EE 212.

**EE 261 Electric Circuits Laboratory (1)**

Techniques of measurement of dc and steady-state ac circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 201.

**EE 301 Network and System Analysis (3)**

Fourier analysis. Fourier and Laplace transform applications. Transient analysis. Transfer functions. Two-port parameters, pole-zero locations and system response. Development and use of Bode plots. 3 lectures. Prerequisite: EE 212, MATH 317.

**EE 302 Linear Control Systems (3)**

Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EE 301, EE 325.

**EE 303 Power Transmission (3)**

Electrical characteristics of three-phase overhead and underground power transmission lines. Development of models for different types of lines as well as interconnected power systems. Introduction of per unit calculations. Introduction of computer simulation methods. 3 lectures. Prerequisite: EE 301.



**EE 325 Energy Conversion Electromagnetics (3)**

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, dc machines, ac induction machines, and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EE 201 or EE 212 and PHYS 133 or EL 207.

**EE 341 Advanced Circuits Laboratory (1)**

Fourier analysis. Two-port networks, pole-zero locations and Bode plots. 1 laboratory. Concurrent or prerequisite: EE 301.

**EE 342 Control Systems Laboratory (1)**

Laboratory work in feedback control systems. 1 laboratory. Concurrent or prerequisite: EE 302, EE 341, EE 365.

**EE 365 Energy Conversion Laboratory (1)**

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Concurrent or prerequisite: EE 325.

**EE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**EE 406 Power System Analysis I (4)**

Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. Power limits and stability, system model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 303.

**EE 407 Power Systems Analysis II (4)**

System protection, relays and relay systems, faults, load flow calculation, computer solutions, power system instrumentation and measurement techniques. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 406.

**EE 410 Power Control I (4)**

Power semiconductor devices. Theory of power diodes, SCR, Triac, MOSFET, HEXFET, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and dc motor control. 3 lectures, 1 laboratory. Prerequisite: EE 325, EL 309.

**EE 411 Power Control II (4)**

Analysis of SCR circuits in inverters and cycloconverters; modeling of inverter-induction motor drive system; regenerative braking; electric propulsion; digital computer study of motor control system. Line commutated inverters and HVDC converters, phase-locked loops and microprocessor based control systems. 3 lectures, 1 laboratory. Prerequisite: EE 410.

**EE 414 Direct Energy Conversion (3)**

Direct energy conversion, and storage, with consideration of resources, batteries, fuel cells, thermoelectricity, thermionic generators, solar energy, cells, MHD, power generation, and related topics. 3 lectures. Recommended as a complement to ME 415. Prerequisite: ME 302.

**EE 417 Alternating Current Machines (4)**

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 325, 365.

**EE 432 Control Systems Engineering (3)**

Advanced course in analysis and design of control systems based on root-locus, frequency domain and computer approach. Nonlinear sampled data and self-adaptive systems. 3 lectures. Prerequisite: EE 302 or consent of instructor.

**EE 444 Power Systems Laboratory (1)**

Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory. Prerequisite: EE 406.

**EE 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 120 hours total time. Prerequisite: EE 325, EL 309, EL 334.

**EE 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of new developments in the fields of power systems and control. Fields of employment and job considerations. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**EE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**EE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**EE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**EE 511 Electric Machines Theory (3)**

Advance topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Excitation systems. 3 seminars. Prerequisite: EE 325 or equivalent, graduate standing or consent of instructor.

**EE 513, 514 Control Systems Theory (3) (3)**

State variables of open loop and closed loop dynamic systems. Mathematical modes. Concepts of sensitivity, controllability and observability. Discrete control. Selected topics such as stability by Lyapunov's functions; adaptive and optimal control; Bellman's dynamic programming and Pontriagin's maximum principle; random processes and stochastic control. 3 seminars. Prerequisite: EE 302 or equivalent, graduate standing or consent of instructor.

**EE 518 Advanced Power System Analysis (3)**

Symmetrical components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 seminars. Prerequisite: EE 406 or equivalent, graduate standing or consent of instructor.

**EE 519 Power System Design (4)**

Design studies involving aspects of an electric power system. Current industrial designs. Computer simulation techniques used extensively. 4 seminars. Prerequisite: EE 518, graduate standing or consent of instructor.

**EE 520 Solar-Photovoltaic Systems Design (3)**

Solar cell and storage battery theory, examination of insolation variability and optimization techniques, principles of grounding protection and control, a survey of power conditioning equipment and system integration techniques. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**EE 525 Stochastic Processes for Engineers (3)**

Stochastic processes used in the solution of engineering problems. Stationary processes and power spectra; Gaussian processes, Poisson processes, Markov and Semi-Markov processes. Applications to the problems of filtering and prediction (Wiener & Kalman filters), and to the problems of queuing traffic congestion, flow of material and equipment in a system. 3 seminars. Prerequisite: EL 414 or equivalent, graduate standing or consent of instructor.

**EE 527 Advanced Network Theory (3)**

Circuits, matrices, and linear vector spaces; linear graph theory; state equations for linear networks in normal form; eigenvalues and eigenvectors; reciprocal networks; normal modes. 3 seminars. Prerequisite: EE 301 or equivalent, graduate standing or consent of instructor.

**EE 563 Graduate Seminar (1)**

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. 1 seminar. Total credit limited to 3 units.

**EE 570 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**EE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the Master of Engineering degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

**EL—ELECTRONIC ENGINEERING****EL 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**EL 207 Introduction to Electric and Magnetic Fields (3)**

Fields and potentials associated with and the forces between static point charges and point current elements. Generalization from point charges and point current elements to line, surface, and volume distributions of charge and current. Field mapping of electric and magnetic fields. Magnetic circuits. Resistance, capacitance and inductance. 3 lectures. Prerequisite: PHYS 131, MATH 143; EE 211 prerequisite or concurrent.

**EL 208 Electronic Devices (3)**

Internal operation, terminal characteristics, and models of diodes, transistors (bipolar and field-effect), and optical devices (LED's and phototransistors). 3 lectures. Prerequisite: EL 207, EE 211, and PHYS 211.

**EL 219 Logic and Switching Circuits (3)**

Modulo-N arithmetic and digital coding techniques. Fundamentals of Boolean Algebra and minimization techniques. Multiple function synthesis using ROM's and PLA's. Combinational circuit design as it applies to computers. Sequential circuit elements, flip-flops, counters and shift-registers. 3 lectures. Prerequisite: CSC 101.

**EL 248 Electronic Devices Laboratory (1)**

Experimental determination of device characteristics and models. 1 laboratory. Concurrent: EL 208.

**EL 303 Signal Transmission (3)**

Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 301.

**EL 307 Digital Integrated Electronics (3)**

Integrated logic circuits: RTL, DTL, TTL, I<sup>2</sup>L, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EL 208, EL 219. Concurrent: EL 347.

**EL 308 Electronic Circuits (3)**

Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EL 208, EE 302 and EL 348 concurrent.

**EL 309 Integrated Electronic Circuits (3)**

Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 302, EL 308. Concurrent: EL 349.

**EL 319 Digital System Design (3)**

Introduction to finite automata theory and the design of digital systems utilizing state-machines, analysis and synthesis of state-machines. Design of synchronous, asynchronous, and pulse mode sequential circuits. Role of the microprocessor in implementing state-machines. Trade-offs between system design utilizing hardware, firmware and microprocessors. 3 lectures. Prerequisite: EL 219, EL 307.

**EL 321 Electronics (3)**

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electronic or Electrical Engineering majors. 3 lectures. Prerequisite: EE 201.

**EL 327 Electronic Instrumentation and Measurement (4)**

Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EL 308.

**EL 328 Discrete Time Systems (3)**

Introduction to the essential theories and techniques of discrete modeling for modern digital processing, applications taken from biological systems, economic systems and digital filtering. 3 lectures. Prerequisite: MATH 317 or MATH 318.

**EL 334 Electromagnetic Fields I (3)**

Advanced treatment of static vector electric and magnetic fields and their sources. Magnetic fields in ferromagnetic materials. Laplace's equation and boundary value problems. 3 lectures. Prerequisite: MATH 317, EL 207.

**EL 343 Signal Transmission Laboratory (1)**

Impedance measurements, traveling-wave phenomena in transmission lines, impedance matching. 1 laboratory. Concurrent or prerequisite: EL 303.

**EL 347 Digital Integrated Electronics Laboratory (1)**

Experimental investigation of the characteristics of different logic families. 1 laboratory. Prerequisite: EL 219. Concurrent: EL 307.

**EL 348 Electronic Circuits Laboratory (1)**

Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Concurrent: EL 308.

**EL 349 Integrated Electronic Circuits Laboratory (1)**

Design of electronic subsystems using integrated circuits. 1 laboratory. Concurrent: EL 309.

**EL 361 Electronics Laboratory (1)**

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Concurrent or prerequisite: EL 321.

**EL 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**EL 401 Electromagnetic Fields II (3)**

Time changing electric and magnetic fields. Maxwell's equations, with the relationship between field and circuit theory. Plane waves in dielectric and conducting media. Selected topics from wave polarization, reflection and refraction. Introduction to selected transmission line, wave-guide and antenna concepts. 3 lectures. Prerequisite: EL 303, EL 334.

**EL 402 Microwave Engineering (3)**

Application of Maxwell's equations and boundary value problems to wave guide structures. Microwave equivalent circuit theorem. Passive microwave devices including treatment of attenuation, insertion loss power division, directional coupling, and the scattering parameters. Introduction to stripline and microstrip techniques. 3 lectures. Prerequisite: EL 401.

**EL 403 Optoelectronic Devices and Techniques (3)**

Optical generation, detection, measurements and displays. Fiber optic system design. Applications of lasers. 3 lectures. Prerequisite: PHYS 211, EL 401.

**EL 404 Microprocessor System Design Methodologies (3)**

Classification and functional configurations of existing microprocessors and analysis of hardware system designs and system economics. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. 3 lectures. Prerequisite: EL 319, EL 407, CSC 306, or consent of instructor.

**EL 405 Advanced Amplifier Theory (3)**

Analysis and design of modern electronic amplifiers and amplifier systems with advanced techniques. Small signal tuned amplifier design utilizing both discrete and integrated devices. VHF, UHF amplifier design using Y and S parameters. Noise analysis. 3 lectures. Prerequisite: EL 303, EL 309.

**EL 407 Digital Computer Subsystems (3)**

Design of registers, counters, sequencers, accumulators, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EL 309, EL 319.

**EL 408 Digital Computer Systems (3)**

Design of computer ALU's microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EL 407, and CSC 306 or consent of instructor.

**EL 409 Computer Peripheral Interfacing (3)**

Design of the more common computer peripherals (paper devices, floppy disks, etc.) with the emphasis on the controller and interfacing aspects. Use of microprocessors and/or LSI controller chips in the design of intelligent peripherals. 3 lectures. Prerequisite: EL 407.

**EL 411 Network Synthesis and Filter Design Fundamentals (3)**

Modern approach to network synthesis. Network functions. Foster and Cauer canonical synthesis. Transfer functions and transfer function synthesis. Approximation theory. Butterworth and Chebyshev filter design. Introduction to digital filter concepts. 3 lectures. Prerequisite: EE 301.

**EL 412 Advanced Analog Circuits (3)**

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EL 309, EL 414.

**EL 413 Analog Integrated Circuits (3)**

Analysis and design of analog integrated circuits. DC and AC designs, feedback techniques, and noise in integrated circuits. Design monolithic operational amplifier with computer simulation programs. 3 lectures. Prerequisite: EL 309.

**EL 414 Introduction to Communication Systems (3)**

Amplitude modulation; frequency and phase modulation; pulse modulation including PAM, PWM, PPM, and PCM; and delta modulation. Noise in communication systems, digital transmission, and introduction to information theory. 3 lectures. Prerequisite: EL 328 and EE 302.

**EL 415 Communication Systems Design (3)**

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EL 309, EL 414.

**EL 421 Solid-state Microelectronics (3)**

Physical basis of solid-state microelectronics. Passive and active integrated circuit components in Bipolar, MOS, thin and thick film systems. Diffusion, oxidation, ion implantation and other fabrication techniques. Microcircuit layout and design: system development, reliability and economic considerations. Future trends. 3 lectures. Prerequisite: Senior standing.

**EL 423 Microwave Electronics (3)**

Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 3 lectures. Prerequisite: EL 401.

**EL 424 Antenna Theory and Application (3)**

Linear antenna theory. Antenna as a matching device. Antenna directivity, gain, efficiency, resistance, aperture, and reciprocity. Application of antenna theory to various types of antennas. 3 lectures. Prerequisite: EL 401.

**EL 425 Active Network Synthesis (3)**

Theory and design of active RC networks with filter applications; cascaded and coupled topology of controlled source, state-variable, gyrator, leap frog, and FDNR realizations; introduction to SCF filters; sensitivity analysis; applied synthesis for various classes of filters. 3 lectures. Prerequisite: EL 309.

**EL 430 Computer-Aided Circuit Design (3)**

Analysis and design of active and passive electronic circuits using digital computers. Graphic terminal and time-sharing systems. Survey of available CAD programs and techniques. Applications of ECAP, SPICE and other programs for dc, ac and transient analysis, including tolerance, sensitivity, optimization and device modeling. 3 lectures. Prerequisite: CSC 311, EL 309, or consent of instructor.

**EL 431 Computer-Aided Design of VLSI Devices (3)**

Design of VLSI circuits, design of subsystems, PLA's and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: Senior standing, EL 319 or equivalent.

**EL 441 Microwave Laboratory (1)**

Experimental investigation of vacuum-tube and solid state microwave sources, crystal and power detectors, coaxial cables, directional couplers and n-port devices. Measurement of SWR by slotted line and reflectometer techniques. Techniques for measurement of attenuation, frequency and power. 1 laboratory. Prerequisite: EL 303, EL 343, EL 401.

**EL 444 Network Synthesis and Filter Design Lab (1)**

Modern network synthesis; network driving point and transfer function synthesis; design, construction and testing filters of the Butterworth and/or Chebyshev kind—lowpass, bandpass, band elimination and highpass filters. 1 laboratory. Concurrent or prerequisite: EL 411.

**EL 445 Advanced Amplifier Design Laboratory (1)**

Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Concurrent or prerequisite: EL 405.

**EL 446 Microprocessor Interfacing Laboratory (1)**

Design and construction of selected digital systems. Utilization of superstrip boards to construct MSI, LSI based logic circuits. Interfacing of student built systems with several representative microprocessors. Hardware/software performance evaluation of microprocessor interfacing techniques. 1 laboratory. Prerequisite: EL 404 concurrent and consent of instructor.

**EL 447 Digital Subsystems Laboratory (1)**

Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: EL 319, EL 347.

**EL 448 Digital Computer Systems Laboratory (1)**

Laboratory analysis and synthesis of digital computer subsystems. Microprogramming of a simple digital computer via computer simulation. Interfacing with digital systems. 1 laboratory. Prerequisite: EL 407, EL 447.

**EL 451 Solid State and Microelectronic Laboratory (1)**

Laboratory investigation of electronic properties of semiconductor materials. Experimental projects in design, fabrication and evaluation of hybrid/monolithic microelectronic devices and circuits. 1 laboratory. Prerequisite: Senior standing or consent of instructor.

**EL 455 Active Network Synthesis Laboratory (1)**

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Concurrent or prerequisite: EL 425.

**EL 456 Communication Systems Laboratory (1)**

Methods of analog and digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EL 414.

**EL 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Miscellaneous course fee required— see Class Schedule. Minimum 120 hours total time. Prerequisite: EE 325, EL 309, EL 319, EL 334.

**EL 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of new developments in the fields of communications, computers, and industrial electronics. Fields of employment and job considerations. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**EL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**EL 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**EL 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**EL 515 Discrete Time Filters (3)**

Digital and switched capacitor filter analysis and design using Z transform techniques. Topics include: frequency domain analysis, approximations to analog filters, and distortion effects. Applications in digital image processing, telecommunications, digital processing of speech and audio/sonar. 3 seminars. Prerequisite: EL 414, graduate standing or consent of instructor.

**EL 517 Information Theory (3)**

Introduction to information transmission theory and coding theory, covering information and entropy, Markov information sources, code properties, coding theorems; Shannon-Fano Codes, linear codes, hamming codes, continuous channels, Gaussian signals and channels. 3 seminars. Prerequisite: EL 414, graduate standing or consent of instructor.

**EL 520 Digital Systems Design (3)**

Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics include state compatibility analysis, state partition analysis, threshold logic, fuzzy logic. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. The microprocessor as a digital subsystem module. 3 seminars. Prerequisite: EL 319, graduate standing or consent of instructor.

**EL 521 Computer Systems (3)**

Organization of digital systems, primarily the modern general purpose, high speed digital computer; arithmetic units, control units, memories, peripheral equipment. Cost and speed trade-offs in the design of such systems. 3 seminars. Prerequisite: EL 407, ENGR 520, or consent of instructor.

**EL 522 Microprocessor-Based Digital System Design (4)**

Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. The role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 3 seminars, 1 laboratory. Prerequisite: EL 404, ENGR 521 or consent of instructor.

**EL 524 Solid State Electronics (3)**

Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 526 Digital Communications (3)**

Analysis of digital communication techniques including quantization noise, baseband modulation, and transmission modulation. Specific topics include: digitization, PCM, delta modulation, differential PCM, TDM, ASK, PSK, FSK, and bit synchronization. 3 seminars. Prerequisite: EL 414, graduate standing or consent of instructor.

**EL 528 Topics in Telecommunication Systems (3-6)**

Topics selected from telephone switching and transmission, data transmission and networking, and microwave relay systems. May be taken for a maximum of 6 units. 3 seminars. Prerequisite: EL 319, EL 401, EL 414 or equivalent, graduate standing or consent of instructor.



**EL 529 Advanced Topics in Microwave Device Electronics (3)**

Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EL 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 570 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENGL—ENGLISH****ENGL 100 Fundamentals of Writing: English as a Second Language (2) (CR/NC)**

Practice of written patterns of English, developing sentences that express meaning clearly; structured writing assignments; writing following reading and discussion of writing task. Credit/No Credit Grading only. Repeatable. 4 lectures.

**ENGL 101 Fundamentals of Writing: Sentence Construction (4) (CR/NC)**

Practice in writing sentences in a larger context with attention paid to sentence variety, rules of grammar and mechanics. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Concurrent enrollment in Writing Workshop recommended (ENGL 103). Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 102 Fundamentals of Writing: Logic and Organization (4) (CR/NC)**

Practice in the strategies of organizing paragraphs in a larger context with attention paid to focus and support. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Concurrent enrollment in Writing Workshop recommended (ENGL 103). Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 103 Writing Workshop (4) (CR/NC)**

Individual tutorial help for students writing themes. Discussion of approaches to specific writing assignments. Writing assignments completed primarily in class. Directed reading of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 106 Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Instruction aimed at mastering specific conventions of standard English; inflections, article usage, pronoun/antecedent agreement, subject/verb agreement, tense agreement and punctuation. Frequent copying and proofreading assignments requiring transformations of grammatical units. Prepares students for ENGL 107. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: Consent of instructor.

**ENGL 107 Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Practice in composing and proofreading essays with focus on the specific features of standard English reviewed in ENGL 106. Additional drill and practice in progressive and perfect tenses, present and past participles, and negating and contradicting. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: ENGL 106 or consent of instructor.

**ENGL 108 Fundamentals of Standard English: Spelling and Vocabulary (4) (CR/NC)**

For speakers of non-standard English variations who need additional work with the conventions of standard English. Programmed instruction in vocabulary development with additional drill and practice in the English sound system as it relates to spelling. Credit/No Credit grading. Repeatable. 4 lectures. Prerequisite: Consent of instructor.

**ENGL 110 Intensive English for Nonnative Speakers (4)**

Practice in oral and written communication, pronunciation, sentence structure, reading, and composition. Prepares students for ENGL 114. 4 lectures.

## ENGL 114 Writing: Exposition (4)

GEB A.1.

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

## ENGL 125 Critical Thinking (3) (Also listed as PHIL 125 and SPC 125)

GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 215 Writing: Argumentation (4)

GEB A.4.

Writing and critical evaluation of argumentative papers. Techniques of research and evaluation of research sources. Discussion of elements of argumentation, inductive and deductive reasoning and use of supporting documentation in written discourse. Examination of special problems in invention, form, style and evaluation. Not open to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

## ENGL 218 Writing: Argumentation and Reports (4)

GEB A.4.

Argumentation in writing. Composing and conveying technical information. Methods of research. Analysis of writing situations. Analysis and criticism of student reports and technical reports. Extensive writing practice in professional formats: reports, proposals, letters, memoranda. Not open to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

## ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4)

GEB C.1.

Selected readings in British literature from its beginnings through the Eighteenth Century. Early and middle English works read in translation. Includes works by such authors as Chaucer, Shakespeare, Milton, Swift, Pope and Johnson. 4 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4)

GEB C.1.

Selected readings in British literature from the Romantic period to the present. Includes works by such Romantic, Victorian, Edwardian and Twentieth Century writers as Wordsworth, Byron, Tennyson, Shaw, Yeats and Eliot. 4 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 240 American Tradition in Literature (4)

GEB C.1.

Selected readings from major authors that show the American literary tradition from the Colonial period into the Twentieth Century. Literary expression of movements that shaped the American character, including Puritanism, Deism, Transcendentalism and Naturalism. Includes works by such authors as Franklin, Emerson, Poe, Whitman, Dickinson, Twain, Frost, Hemingway and Faulkner. 4 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 251 Great Books of World Literature: Classical and Ancient World (3)

GEB C.1.

Selected readings from world writings, beginning with the earliest epics through the literature of Greece and Rome. Includes such authors as Homer, Aeschylus, Sophocles, Euripedes, Plato and Ovid. 3 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)

GEB C.1.

Selected masterpieces from the fall of the Roman Empire up to the Eighteenth Century. Includes such authors as Dante, Cervantes, Shakespeare, Moliere, Voltaire and Swift. 3 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3)

GEB C.1.

Selected works from the beginning of Romanticism up to the present. Includes material from literary movements such as Realism, Naturalism, Symbolism and Existentialism, with works by such authors as Goethe, Hugo, Keats, Wordsworth, Flaubert, Balzac, Dostoevsky, Woolf, Joyce and Beckett. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 255 The Bible as Literature (3)**

The Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 260 Children's Literature (3)**

Analysis and evaluation of realism, traditional fantasy, modern fantasy, and poetry for children in multiple subject classroom grades K-8. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 290 Introduction to Linguistics (4)**

Overview of linguistics from its origin to present forms and practices. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 302 Writing: Advanced Composition (4)**

Writing and analysis of expository and argumentative papers at an advanced level. Discussion and application of rhetorical, stylistic and grammatical principles through writing and critical reading of essays. Practice in revising and editing papers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 310 Corporate Communication (4)**

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 311 Advanced Technical Writing (4)**

Technical writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to technical communication careers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 318 Writing for Scientific Journals (4)**

Practice of the skills necessary in the preparation of articles for scientific journals. Extensive writing and copy-editing, and study of the forms and styles required by the professional societies in each field. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 325 Creative Writing (4)**

Instruction and practice in the writing, revising, and evaluating of fiction, poetry, or drama. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 326 Literary Criticism (4)**

Instruction and practice in writing, revising, and evaluating various kinds of critical writing. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 330 British Literature: Medieval Period (4)****GEB C.3.**

Major works of the Old and Middle English periods in modern translation, including epic and lyric poetry, early religious writings, romance cycles and mystery and morality plays. Representative works include Beowulf, the Arthurian legends, Everyman and Chaucer's Canterbury Tales. 4 lectures. Prerequisite: One literature course.

**ENGL 331 British Literature: The Renaissance (4)****GEB C.3.**

Major works of Elizabethan and Jacobean prose, poetry and drama. Literary responses to the foundations of humanism, individualism, nationalism and other forces of change leading from the medieval to the modern world. Representative writers include Spenser, Sidney, Donne, Jonson, Bacon and Milton. 4 lectures. Prerequisite: One literature course.

**ENGL 332 British Literature: The Enlightenment (4)****GEB C.3.**

Major prose, poetry, and drama from 1660 to 1800, emphasizing the period's interest in order, reason, rules and decorum in both life and literature. Representative writers include Dryden, Swift, Pope, Johnson, Boswell and Defoe. 4 lectures. Prerequisite: One literature course.

## ENGL 333 British Literature: Romanticism (4)

GEB C.3.

Major works of the Romantic period. Romantic concepts of imagination, individualism, nature and the organic qualities of art. Representative writers include Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. 4 lectures. Prerequisite: One literature course.

## ENGL 334 British Literature: The Victorians (4)

GEB C.3.

Major prose and poetry of the Nineteenth Century. Victorian concerns such as progress, belief, alienation and threats to the sense of personal identity in a technological age. Representative writers include Carlyle, Ruskin, Tennyson, Browning and Arnold. 4 lectures. Prerequisite: One literature course.

## ENGL 339 Introduction to Shakespeare (3)

GEB C.3.

Readings from such works as *Hamlet*, *King Lear*, *A Midsummer-Night's Dream* and the sonnets. 3 lectures. Prerequisite: One literature course.

## ENGL 340 American Literature to 1860 (4)

GEB C.3.

Selected prose and poetry by American writers to 1860, showing the Colonial foundation of our national literature, developments of the Enlightenment and achievements of the Romantic age. Representative writers include Bradstreet, Edwards, Franklin, Paine, Emerson, Poe, Hawthorne, Thoreau and Melville. 4 lectures. Prerequisite: One literature course.

## ENGL 341 American Literature: 1860-1914 (4)

GEB C.3.

Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: One literature course.

## ENGL 342 American Literature: 1914 to the Present (4)

GEB C.3.

Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O'Neill. 4 lectures. Prerequisite: One literature course.

## ENGL 350 Modern Novel (3)

GEB C.3.

Readings in representative Twentieth Century novels with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

## ENGL 351 Modern Poetry (3)

GEB C.3.

Readings in representative Twentieth Century poetry with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

## ENGL 352 Modern Drama (3)

GEB C.3.

Readings in representative Twentieth Century drama with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

## ENGL 360 Literature for Adolescents (3)

Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: ENGL 114 or equivalent.

## ENGL 370 World Cinema (4)

GEB C.3.

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 activity. Prerequisite: One literature course.

## ENGL 380 Contemporary Literary Ideas (3-4)

GEB C.3.

Literature or cinema of the modern period. Significant writers and filmmakers, both from the Western world and the non-Western world, and their literary and technical achievements. Demonstrates relationships of prevailing Twentieth Century modes of thought. Repeatable to 9 units under different subtitles. 3 or 4 lectures. Prerequisite: One literature course.

**ENGL 390 Modern English Grammar (4)**

Linguistic analysis of the English language. Phonology, morphology, and syntax. Traditional, descriptive-structural, and transformational-generative grammars. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 392 Contemporary Grammar and Composition (4)**

Instruction and practice in writing and revising essays. Emphasis on rhetorical principles for clear composition, using the English language and grammar systems as subjects. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 395 History of the English Language (4)**

The development of the English language from its origins to its present forms and practices. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ENGL 415 Advanced Creative Writing (4)**

Instruction and practice in advanced writing, revising and evaluating of fiction or poetry. 4 lectures. Prerequisite: ENGL 325 or permission of instructor. Repeatable to 8 units.

**ENGL 421 Writing in Secondary Schools (4)**

Approaches to writing in secondary schools. Overview of composition theory and examination of current research on the teaching of writing. Exploration of classroom techniques appropriate to student needs and program goals. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 424 Organizing and Teaching English (4)**

Introduction to the organization, selection, presentation, application, and interpretation of subject matter in English in secondary schools. 4 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

**ENGL 430 Chaucer (4)**

Selected readings from *Canterbury Tales* and Chaucer's other major poems. 4 lectures. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 431 Shakespeare (4)**

Representative comedies, tragedies, and histories. 4 lectures. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 432 Milton (4)**

*Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 lectures. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 439 Significant British Writers (4)**

Selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 449 Significant American Writers (4)**

Selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: ENGL 340, or ENGL 341, or ENGL 342.

**ENGL 459 Significant World Writers (4)**

Selected world writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: 8 units of literature or consent of instructor.

**ENGL 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum of 60 hours total time. Prerequisite: Prior consent of instructor.

**ENGL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ENGL 495 Applied Language Study (4)**

Linguistic theory applied to human communications, human relations, and literature. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 lectures. Prerequisite: ENGL 390 or consent of instructor.

**ENGL 496 Introduction to Teaching English as a Second Language/Dialect (4)**

Language analysis and assessment; methods and materials for testing and teaching nonnative English speakers; phonemic analysis, oral-aural testing; oral-aural practice; vocabulary acquisition; oral and written patterns of organization, structure, grammar; acquiring English for special purposes; evaluating curriculum materials; observing and tutoring ESL students. 4 lectures. Prerequisite: 8 units of linguistics or consent of instructor.

**ENGL 502 Seminar in Critical Analysis (4)**

Basic approaches used by critics. Multiple points of view; application to literary works; reflection of critical analysis in student compositions. Designed to aid the teacher of secondary English to enrich the courses taught in secondary schools. 4 seminars. Prerequisite: Graduate standing.

**ENGL 503 Seminar in English Linguistics (4)**

Review of current modes of linguistic study and introduction to linguistic research and its application. 4 seminars. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

**ENGL 504 Seminar in Applied English Linguistics (4)**

Development of English; consideration of problems of grammar and uses of language. May be repeated to 12 units. 4 seminars. Prerequisite: ENGL 503.

**ENGL 505 Seminar in Composition Theory (4)**

Special problems in composition. Direct application of new language information to composition or detailed analysis of relationship between rhetorical principles and writing. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 506 Pedagogical Approaches to Composition (4)**

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of day to day experiences in the classroom. Discussion of and research into the nature and solution of student writing problems. Required of all new teaching assistants in English. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 511 Seminar in American Literature (4)**

American authors and periods. Written and oral reports of individual investigation. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 512 Seminar in British Literature (4)**

British authors or periods. Written and oral reports of individual investigation. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 513 Seminar in Special Topics (4)**

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 520 Problems in Secondary English (3)**

Topical issues in teaching secondary school English. Designed especially for credentialed teachers in the field. Alternate topics like the following: writing instruction workshop, teaching masterworks and young adult literature, implications of rhetorical and discourse theories, computer technology in English, literary criticism and teaching, research in reading and writing. Written reports of topic investigations. May be repeated to 9 units. 3 seminars. Prerequisite: Graduate standing in English.

**ENGL 590 Directed Study (4)**

Independent or group study of special problems in selected areas of language, composition, or literature. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGR—ENGINEERING****ENGR 111 Introduction to Plant Engineering (2)**

Survey of career opportunities in plant engineering. Job entry requirements and employment procedures. Technical and professional preparation. 2 lectures.

**ENGR 251 Digital Computer Applications (2)**

GEB F.1.

Programming techniques and procedures with applications to several selected engineering problems from a variety of course situations. Actual problem solutions by means of a digital computer will be required. 2 activities. Prerequisite: MATH 142 or MATH 132, PHYS 131 or PHYS 121.

**ENGR 301 Technology in the 20th Century (3)**

GEB F.2.

Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**ENGR 302 Plastics Design (2)**

Properties of plastics as a class of materials. Interpretation of plastic design data. Principles underlying the properties of plastics. Design problems. Laboratory applications of plastics processes and their effects on design. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory. Prerequisite: CHEM 122 or CHEM 125 or consent of instructor.

**ENT—ENTOMOLOGY****ENT 220 Agricultural Entomology (4)**

Major insect orders and families of agricultural importance. Taxonomy, identification, life cycles, and histories and controls of insects. 2 lectures, 2 laboratories.

**ENT 326 General Entomology (4)**

Introduction to the study of insects. Structure, major orders and families of insects, life histories, economic importance and control. Insect collection required. 3 lectures, 1 laboratory.

**ENT 332 Economic Entomology (4)**

Identification, life histories and control of insects beneficial or injurious to various crops, fruits, stored products, domestic animals and man; important invertebrates such as mites, ticks and spiders. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 or BOT 122; ENT 326; CHEM 326 or consent of instructor.

**ENT 421 Immature Stages of Insects (4)**

Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: ENT 326, BIO 325.

## ENVE—ENVIRONMENTAL ENGINEERING

### ENVE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### ENVE 240 Additional Engineering Laboratory (1–2)

Elective project work. Total credit limited to 4 units with not more than 2 units in any quarter. 1 or 2 laboratories.

### ENVE 304 Thermodynamics of Processes (3)

Material balances, energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302; CHEM 129 or consent of instructor.

### ENVE 309 Noise and Vibration Control (3)

Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. 3 lectures. Prerequisite: PHYS 133, MATH 241.

### ENVE 316 Automatic Process Control (2)

Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: MATH 242, ME 302, ME 313.

### ENVE 324 Introduction to Air Pollution (3)

GEB F.2.

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For nonmajors. 3 lectures. Prerequisite: Junior standing.

### ENVE 325 Environmental Air Quality (3)

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. 3 lectures. Prerequisite: CHEM 125. Concurrent: ME 302.

### ENVE 326 Air Pollution Measurements (3)

Planning and conducting of atmospheric surveys. Collection, evaluation, and interpretation of data as they pertain to the concentration of pollutants sampled. 2 lectures, 1 laboratory. Prerequisite: CHEM 129, ENVE 325.

### ENVE 330 Environmental Quality Control (3)

GEB F.2.

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For nonengineering majors. 3 lectures. Prerequisite: Junior standing.

### ENVE 331 Introduction to Environmental Engineering (3)

Application of scientific, engineering, and economic principles to development and control of environmental problems. Air pollution control. Water and wastewater treatment. Hazardous wastes. Resource recovery. Noise control. Legal and administrative aspects. 3 lectures. Prerequisite: Junior standing in School of Engineering and Technology.

### ENVE 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

### ENVE 411 Air Pollution Control (3)

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 326.



**ENVE 421 Mass Transfer Operations (3)**

Theory, principles and practices related to the control of gaseous emissions. Process characteristics. Odor control. Mass transfer operations as applied to environmental control. 3 lectures. Prerequisite: ENVE 325.

**ENVE 422 Environmental Radiation Surveillance (2)**

Sources of radioactive contaminants, biological effects, radiation protection. Environmental sampling and analysis of airborne radiation. Controls and disposal of wastes. 2 lectures. Prerequisite: ENVE 325, PHYS 133, CHEM 125.

**ENVE 428 Meteorology (3)**

Weather instruments; insolation convection and advection; land and sea breezes; fog, smogs, clouds, and showers; thunderstorms; lapse rate and temperature inversions; cyclones; anti-cyclones; tornadoes and waterspouts; stacks and plumes; meteorological conditions under which air pollution accumulates. 2 lectures, 1 laboratory. Prerequisite: PHYS 122 or PHYS 132.

**ENVE 434 Water Quality Measurements (2)**

Methods employed in the qualitative and quantitative determinations of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisite: CHEM 129, CHEM 326.

**ENVE 435 Water and Waste Water Treatment (4)**

Unit operations and unit processes encountered in potable water and waste water treatment. Principles of physical operations; screening, mixing and agitation, sedimentation, filtration, heat and mass transfer. Chemical and biological processes used in potable water and waste water treatment. 4 lectures. Prerequisite: CHEM 306, ENVE 434

**ENVE 438 Water and Waste Water Treatment (3)**

Application of the physical operation, and chemical and biological unit processes principles to the analysis and design of potable water and waste water treatment facilities. Advanced waste water treatment technology. Water and waste water sludge treatment. 3 lectures. Prerequisite: ENVE 435.

**ENVE 439 Solid Waste Management (2)**

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 2 lectures. Prerequisite: ENVE 435.

**ENVE 440 Solid Waste Management Laboratory (1)**

Statistical, analytical, and laboratory experiments in solid waste management. Including approximate analysis of wastes, energy content of waste materials, and field trips to selected solid waste processing activities. 1 laboratory. Prerequisite: ENVE 439 or concurrent enrollment.

**ENVE 441, 442 Advanced System Design (3) (3)**

Individual and team project work in designing systems for industrial ventilation, air and water pollution control, solid waste disposal and heating, ventilating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 313, ME 341.

**ENVE 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 150 hours total time.

**ENVE 465 Environmental Management and Urban Systems (2)**

Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in METRO-APEX, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Consent of instructor.

**ENVE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ENVE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ENVE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

**ENVE 534 Advanced Design of Pollution Control Systems (3)**

Comprehensive problems in pollution control. Methods of analysis, design of unit operations and processes for environmental engineering facilities. 3 seminars. Prerequisite: Graduate standing and ENVE 325.

**ENVE 535 Advanced Wastewater Treatment (3)**

Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENVE 536 Biological Wastewater Treatment Processes Engineering (3)**

Fundamentals of reactor engineering. Biochemical and microbiological background. Modeling and design of biochemical reactors. 3 lectures. Prerequisite: ENVE 439, CE 440, graduate standing or consent of instructor.

**ENVE 541 Resource and Energy Recovery from Waste (3)**

In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Processes to be studied: mechanical sorting, recycling, combustion, gasification, and anaerobic digestion. 3 lectures. Prerequisite: ENVE 325 (recommended), ENVE 439, CE 440 or equivalent, graduate standing or consent of instructor.

**ENVE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned an industrial project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. An appropriate experimental or analytical thesis may be accepted. Prerequisite: Graduate standing.

**ET—ENGINEERING TECHNOLOGY****ET 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ET 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation of techniques, studies or laboratory application of selected problems. Total credit limited to 4 units, with maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ET 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see Class Schedule. Minimum 150 hours total time. Prerequisite: Senior standing.

**ET 463 Undergraduate Seminar (2)**

Special studies and technical developments in the field. Individual reports on important technology in the engineering technology field. 2 seminars. Prerequisite: SPC 202 and senior standing.

**ET 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ET 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

## **ETAC—ENGINEERING TECHNOLOGY—AIR CONDITIONING**

**ETAC 121 Air Conditioning and Refrigeration Principles (4)**

Principles of commercial and industrial air conditioning and refrigeration systems. Installation, service maintenance, and cost estimating. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

**ETAC 122 Environmental Graphics (2)**

Principles and practices of mechanical and architectural graphics applied to the development of the spatial concepts essential to the design and installation of environmental systems. 1 lecture, 1 laboratory.

**ETAC 123 Environmental Graphics and System Design (2)**

System design and layout of environmental control systems. Energy analysis, air distribution, hydronic and solar systems. 1 lecture, 1 laboratory. Prerequisite: ETAC 122.

**ETAC 201 Air Conditioning and Refrigeration Codes (5)**

Introduction to current federal, state, and local codes for equipment, sanitation, water and fuel supplies, fire protection and human safety as applied to building plumbing, heating, ventilating, refrigeration, and air conditioning systems. 4 lectures, 1 laboratory.

**ETAC 221 Mechanical Equipment of Buildings (3)**

Application of engineering analysis comfort control. Design includes forced air circulation systems, sanitary plumbing, water supply and energy sources. Applicable building code requirements which influence system design. 2 lectures, 1 laboratory. Prerequisite: PHYS 123.

**ETAC 301 Computer Aided HVAC (3)**

Programming techniques, estimating and design problems peculiar to Heating and Ventilating and Air Conditioning industry. 1 lecture, 2 activities. Prerequisite: Junior standing or consent of instructor.

**ETAC 302 Heat Exchanger Technology (3)**

Heat exchanger applications for the heating, ventilating, air conditioning and refrigeration industries. 2 lectures, 1 laboratory. Prerequisite: PHYS 122, ETAC 331.

**ETAC 321 Air Distribution Systems (3)**

Materials and techniques in fabrication and installation of air ducts for heating, ventilating, refrigerating, and air conditioning. Introduction to fabrication of air handling equipment and related accessories for high and low velocity systems. 1 lecture, 2 laboratories. Prerequisite: ETAC 123, ETMP 246.

**ETAC 331, 332 Refrigeration Systems (4) (4)**

Operation, installation, and supervision of medium and low temperature refrigeration systems for food and product processing and storage using various staging systems. Cold storage and building requirements for efficient operation. Low temperature testing and cryogenic refrigeration. Transport refrigeration system. 3 lectures, 1 laboratory. Prerequisite: ETAC 121.

**ETAC 425, 426 Air Conditioning Systems (4) (4)**

Application of complete air conditioning consisting of heating, ventilating, humidification, dehumidification, refrigeration, air pollution, water treatment and control equipment for commercial and industrial applications. 3 lectures, 1 laboratory. Prerequisite: ETAC 332.

**ETAC 439 Instruments and Controls (3)**

Application of instrumentation and automatic controls to heating, ventilation and air conditioning systems. 2 lectures, 1 laboratory. Prerequisite: ETEL 126.

**ETAC 445 Advanced Control Systems (3)**

Electrical, electronic, and pneumatic systems used to control heating, ventilating and air conditioning installations. 2 lectures, 1 laboratory. Prerequisite: ETAC 439.

**ETEL—ENGINEERING TECHNOLOGY-ELECTRONIC****ETEL 124 Introduction to Electronic Circuits (4)**

Application of DC and AC circuit concepts to the solution of electronic circuit problems. 3 lectures, 1 laboratory.

**ETEL 125 Introduction to Electronic Devices (4)**

Application of AC/DC theory to the understanding of basic electronic devices. 3 lectures, 1 laboratory. Prerequisite: ETEL 124.

**ETEL 126 Electrical Practices (4)**

Fundamentals of industrial power distribution systems. Introduction to theory and practice of polyphase circuits and motors. Electrical safety, industrial wiring practices, and practical trouble shooting. 3 lectures, 1 laboratory. Prerequisite: ETEL 125.

**ETEL 151 Electronic Graphics and Standards (2)**

Schematic drafting and representation of electrical and electronic circuits, solid state devices, transducers and machines. Layouts, technical sketching, industrial standards and symbols. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

**ETEL 218 Digital Circuits I (3)**

Mathematical and logic foundations of digital systems. Topics include: number systems, Boolean Algebra, logic symbology, implementation of combinational networks, flip-flops, registers. 3 lectures. Prerequisite: MATH 120. Corequisite: ETEL 125.

**ETEL 230 Electric Machine Technology (3)**

DC and AC motors and generators, their construction selection and application, and the use of electric and electronic control of these devices. 2 lectures, 1 laboratory. Prerequisite: ETEL 126.

**ETEL 232 Electronic Circuits and Devices I (4)**

Semiconductor devices and circuits. H-parameters and load line techniques in analyzing amplifiers. Computation of current, voltage, and power gains, input and output impedances. Bias stability and leakage current considerations. 3 lectures, 1 laboratory. Prerequisite: ETEL 234.

**ETEL 233 Electronic Circuits and Devices II (4)**

Active discrete and integrated devices. Use of device parameters and specifications to analyze simple linear circuits. Use of pulse and timing circuits, power amplifier circuits, and active regulated DC power supplies. 3 lectures, 1 laboratory. Prerequisite: ETEL 232.

**ETEL 234 Passive Network Analysis (4)**

Basic passive network analysis. Review of DC circuits and application of Thevenin and Norton theorems to steady state AC networks. Use of complex number ( $j$ -operator) in circuit analysis. Development of AC passive circuit transfer functions with gain-phase versus frequency analysis (Bode Plots). Series-parallel equivalent circuits of RLC circuits and transformers. Introduction to RC and RL transients analysis. 3 lectures, 1 laboratory. Prerequisite: ETEL 125, MATH 131.

**ETEL 311 Transmission Lines and Antennas (4)**

Application of transmission lines and antennas. Smith charts and the propagation of the radio signal from various antennas. 3 lectures, 1 laboratory. Prerequisite: ETEL 234, MATH 132 concurrently.

**ETEL 312 Active Linear Circuits (4)**

Analysis and design of multistage transistor amplifier with emphasis on the operational amplifier and its applications. Low-frequency and high-frequency limitations, Miller effect, pulse testing, Bode Plots, Nyquist stability criteria. Barkhausen criteria for oscillation. Power amplifiers, heat sinks, integrated circuit voltage regulators. 3 lectures, 1 laboratory. Prerequisite: ETEL 233, MATH 133.

**ETEL 334 Digital Circuits II (4)**

Analysis of electronic digital circuits. Topics include: Bipolar and MOS logic gates, loading and interfacing, counters, adders, memories, encoders, decoders, digital displays, A/D and D/A converters. 3 lectures, 1 laboratory. Prerequisite: ETEL 218, ETEL 233.

**ETEL 335 Communications I (4)**

Communication signal spectrum investigation includes time domain to frequency domain conversions using Fourier analysis. Evaluation of various modulation techniques including amplitude, angle, and pulse forms. Noise, its use and effects in communications, and various forms of solid state RF amplifiers. 3 lectures, 1 laboratory. Prerequisite: ETEL 311, ETEL 312.

**ETEL 338 Introduction to Computer Technology (4)**

Selected computer components, circuits and systems and their influence on programming in machine language. Problem solving using a digital computer. 3 lectures, 1 laboratory. Prerequisite: ENGR 251, ETEL 334.

**ETEL 432 Automatic Control (4)**

Electronic and electromechanical systems used in servomechanisms. Stability criteria. Nichols Chart utilization. Compensation networks and control system testing. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

**ETEL 435 Communications II (4)**

Analysis of communication systems. Receivers, transmitters, analog and digital techniques. Equipment specifications, measurement techniques, application of Modems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

**ETEL 438 Computer Technology I (4)**

Analysis of computer circuits and components in a specific digital computer. Effects of computer architecture on machine and assembly language programming. Use of hardware and software aids for troubleshooting and development. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

**ETEL 441 Video Technology (4)**

Introduction to colorimetry principles. Review of television system synchronization and compatibility requirements. Analysis of the operation of circuits in a solid state television. Circuit responses observed in laboratory. Field trip to a major network television facility. 3 lectures, 1 laboratory. Corequisite: ETEL 335.

**ETEL 449 Computer Technology II (4)**

Study of a particular computer system and the associated operating system. Use of diagnostic programs as an aid to troubleshooting and maintenance. Analysis of peripheral devices and techniques for interfacing. Use of maintenance manuals and lab equipment to locate malfunctions. 3 lectures, 1 laboratory. Prerequisite: ETEL 438.

**ETEL 452 Filter Networks (4)**

Theory and application of filter networks. Butterworth and Chebyshev passive filters and use of IC operational amplifiers in active filters. Special filters such as ceramic, crystal, mechanical, SAW and digital. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

**ETEL 455 Electro-Optics Technology (4)**

Fundamentals of electro-optics devices and circuits. Parameters, units, sources and systems found in electro-optics. Solving problems encountered in electronics and optics. Laboratory study of devices, circuits and systems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

**ETHS—ETHNIC STUDIES****ETHS 114 Racism in American Culture (3)**

Survey and analysis of racism in the development of American institutions and its effect upon minority ethnic groups and society. 3 lectures.

**ETHS 210 Cultural Heritage (3)**

History and culture of selected minority groups, their role in and contributions to the American cultural heritage. Total credit limited to 9 units. 3 lectures.

**ETME—ENGINEERING TECHNOLOGY—MECHANICAL****ETME 131 Introduction to Engineering Drawing (2)**

Basic instruction in drafting methods, techniques and use of equipment. Geometric constructions. Principles and practices of isometric, oblique, and multiview drawing systems. 1 lecture, 1 laboratory.

**ETME 141 Applied Descriptive Geometry (2)**

Graphical solutions of problems involving points, lines and planes in three-dimensional space by method of multiview projection. Intersections and development of geometric solids. Application to engineering design. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

**ETME 142 Engineering Drawing I (1)**

Advanced principles and methods of multiview and pictorial drawing. Conventional industrial drafting practices including sectioning and dimensioning techniques. Auxiliary views. Pipe drawing. Threads and fasteners. Dimensioning and tolerancing. Surface finishes. Drawing reproduction processes. 1 laboratory. Prerequisite: ETME 131 or recent high school drafting.

**ETME 143 Engineering Drawing II (1)**

Working drawings of mechanical components including details and assemblies. Selection of views, scales, dimensions, symbols and notes. Title blocks. Engineering change systems. Off-line and onterminal experiences in computer aided drafting procedures utilizing the CRT, light pen, alphanumeric keyboard and function keyboard logon, retrieval and file subroutines. 1 laboratory. Prerequisite: ETME 142.

**ETME 205 Statics (3)**

Statics by scalar methods. Includes forces, couples, resultants, equilibrium, trusses, cables, friction, centroids, and moments of inertia. 3 lectures. Prerequisite: MATH 131, PHYS 121.

**ETME 206 Dynamics (4)**

Dynamics by scalar methods. Includes kinematics (both absolute and relative motion of particles and bodies) and kinetics, force, mass, acceleration, work and energy, impulse and momentum, and fundamentals of vibrations. 4 lectures. Prerequisite: ETME 205.

**ETME 301 Thermodynamics (4)**

Fundamental concepts of work, heat, and energy. First and second laws of thermodynamics. Properties of ideal gases and vapors. Combustion, vapor and gas power cycles. Introduction to heat transfer fundamentals. 4 lectures. Prerequisite: PHYS 122, CHEM 121, MATH 132.

**ETME 311 Fluid Mechanics (3)**

Principles that underlie the flow of various fluids. Fluid statics, kinematics of fluid flow, viscosity and fluid friction. Incompressible flow in pipes and open channels, flow measurement, fluid machinery and lubrication. 3 lectures. Prerequisite: PHYS 122, ETME 205.

**ETME 320 Mechanisms (3)**

Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 1 lecture, 2 laboratories. Prerequisite: ETME 142, ETME 206.

**ETME 333 Industrial Hydraulics and Pneumatics (4)**

Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulic and pneumatic components such as pumps, compressors, cylinders, motors, valves, accumulators, lines, fittings, filters, etc. Hydraulic fluids. Component selection and circuit layout using U.S. standard graphic symbols. 3 lectures, 1 laboratory. Prerequisite: ETME 311 or consent of instructor.

**ETME 335 Selection of Engineering Materials (2)**

Concepts and properties of materials and their relevance to industrial applications. Selection of metals, plastics, ceramics, composites, etc. 2 lectures. Prerequisite: ETMP 144, ETWT 144, IE 141, MET 235.

**ETME 337 Instrumentation of Mechanical Systems (3)**

Principles of process instrumentation and control. Temperature, pressure, flow and level measurement. Analytical instrumentation. Pneumatic and electric transmission devices and controllers. Signal conditioning. Recorders and indicators. 2 lectures, 1 laboratory. Prerequisite: ETEL 125, ETME 311.

**ETME 338 Industrial Engines (4)**

Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes various types of engines, turbines, boilers and some of the newer developments being applied in industry. Fuel conservation and pollution control. 3 lectures, 1 laboratory. Prerequisite: ETME 301, ETME 337.

**ETME 344 Advanced Design Drawing (2)**

Preparation of detail and assembly drawings from design layouts. Tolerances on lineal dimensions and geometric form. Surface finish symbols, production notes and parts lists. Threads, fasteners and applications of welding symbols. 2 laboratories. Prerequisite: ETME 143.

**ETME 421, 422 Applied Machine Design (4) (4)**

Machine design emphasizing properties of materials relative to structural loading and design; layout of machine elements. Laboratory includes solution of realistic design projects. 2 lectures, 2 laboratories. Prerequisite: ETME 344, ETME 320, CE 202, CE 203.

**ETME 437 Applied Fluid Power Systems (4)**

Application of hydraulic and pneumatic equipment. Design, selection and layout of devices and systems including electrical and pneumatic control logic. 2 lectures, 2 laboratories. Prerequisite: ETME 333, ETME 421, ENGR 251.

**ETME 443 Mechanical Systems (4)**

Application of technical principles incorporating various components into an integrated system. Project design oriented activities so that the student becomes familiar with component selection and layout of mechanical systems, emphasizing industrial handbook and catalog material. 4 laboratories. Prerequisite: ETME 333, ETME 335, ETME 422.

## **ETMP—ENGINEERING TECHNOLOGY—MANUFACTURING PROCESSES**

**ETMP 121 Manufacturing Survey (1)**

Overview of manufacturing processes relating to metals and plastics. Includes study of materials, thermal cutting systems, welding, forming, machining, and foundry processes. Open to all majors. 1 lecture.

**ETMP 144 Manufacturing Processes: Machining I (2)**

Uses, capabilities, theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Study of cutting tool characteristics, cutting fluids, quality control, production methods and economics. 1 lecture, 1 laboratory.

**ETMP 145 Manufacturing Processes: Machining II (1)**

Relationship between engineering design and production fabrication. Hole forming by drilling, broaching, punching, piercing and nontraditional methods. Numerical control drilling. Forming and assembling of gage metal components. Engineering and economic significance of various production techniques. 1 laboratory.

**ETMP 153 Electronic Assembly Techniques (2)**

Fabricating electronic and electrical units. Soldering techniques including production methods. Printed circuit techniques, electrical connections, cabling processes and component assembly. Project planning. 1 lecture, 1 laboratory. Prerequisite: ETWT 152.

**ETMP 224 Advanced Machining Technology (4)**

Theory and operational problems of manual and automatic machine tools. Evaluation of cutting tool geometry, machinability, and tool performance with conventional and exotic materials and processes. 2 lectures, 2 laboratories. Prerequisite: ETMP 144.

**ETMP 240 Additional Engineering Laboratory (1)**

Advanced production and toolroom problems. Design and construction of laboratory tooling and instrumentation. Individual and group investigation of selected problems. Total credit limited to 4 units, not more than 2 units per quarter. 1 laboratory. Prerequisite: Consent of instructor.

**ETMP 245 Advanced Machining Operations (3)**

Advanced applications of conventional milling machines, turret lathes and automatic screw machines. Use of machine accessories, fixtures and attachments. Instrumentation for quality control. Nontraditional machining processes. Precision sawing and gear manufacture. 1 lecture, 2 laboratories. Prerequisite: ETMP 144.

**ETMP 246 Duct Design and Fabrication (2)**

Relationships between engineering design and production fabrication and installation. Air distribution systems, duct work, materials, commercial fabrication methods. Installation techniques and cost estimating. 1 lecture, 1 laboratory. Prerequisite: ETME 141.

**ETMP 321, 322, 323 Tool Design (3) (3) (3)**

Design of manufacturing tools such as jigs, fixtures, and dies. Material selection, tolerance balancing, and quality control requirements as economic design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Corequisite: ETMP 224, ETME 344 or consent of instructor.



**ETMP 325 Abrasive Machining and Finishing (2)**

Properties of abrasives for cutting tool application. Selection, care, and preparation of bonded abrasives used on machine tools. Fundamentals of machine grinding, emphasizing productivity, attainment of surface finish and comparison to other processes. 1 lecture, 1 laboratory. Prerequisite: ETMP 245.

**ETMP 336 Numerical Control Programming (3)**

Numerical control machine tool programming including: linear and circular interpolation. G, M, S and T functions. 2 and 3 axis contouring. Principles and concepts of N/C fixtures, tooling and set-up practices. 2 lectures, 1 laboratory. Prerequisite: IE 233.

**ETMP 421 Computer Aided Manufacturing Technology (3)**

Computer aided numerical control programming using APT, UNIAPT, Compact II and other programming languages. Tool motion optimization studies, developing subroutines, repetitious part programming and adaptive control. 2 lectures, 1 laboratory. Prerequisite: ETMP 336 or consent of instructor.

**ETMP 434, 435, 436 Tool and Manufacturing Engineering (3) (3) (3)**

Construction and testing of jigs, fixtures, dies, and special tools for production. Design, engineering, and economical application of conventional and specialized machine tools. Field trips to manufacturing centers. 1 lecture, 2 laboratories. Prerequisite: ETMP 323.

**ETWT—ENGINEERING TECHNOLOGY—WELDING TECHNOLOGY****ETWT 144 Manufacturing Processes (2)**

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. 1 lecture, 1 laboratory.

**ETWT 152 Micro Bonding (2)**

Theory, practice, and applications of joining processes associated with electronic circuitry including soldering, thermocompression, ultrasonic and beam lead bonding, plasma needle arc, and electron beam welding. 1 lecture, 1 laboratory. Prerequisite: ETEL 151.

**ETWT 155 Industrial Welding Technology (1)**

Application of various electric welding processes to joining of steel sheet and plate. Includes short circuiting arc, flux cored electrode, gas metal arc, and shielded metal arc processes. Gas welding of steel pipe and hard surfacing. 1 laboratory. Prerequisite: ETWT 144.

**ETWT 156 Welder Qualification Technology (1)**

Out of position fillet and groove welds in carbon steel plate. Welder qualification tests according to code requirements. 1 laboratory. Prerequisite: ETWT 144.

**ETWT 224 Weld Evaluation Methods (2)**

Methods of evaluating weld samples of ferrous and nonferrous materials. Preparation of specimens using chemical and electrolytic etching. Basic photographic techniques used to display weld samples in engineering reports. 1 lecture, 1 laboratory. Prerequisite: ETWT 144.

**ETWT 240 Additional Welding Laboratory (1)**

Individual investigation of current methods and applications. Studies of laboratory procedures and selected problems. Total credit limited to 4 units, not more than 2 units per quarter. 1 laboratory. Prerequisite: ETWT 144 or consent of instructor.

**ETWT 259 Advanced Welding (2)**

Theory and application of various gas shielded arc welding processes to the welding of aluminum, carbon steel, and stainless steel. 1 lecture, 1 laboratory. Prerequisite: ETWT 144.

**ETWT 324 Welding Technology (4)**

Structure of metals, types of steel and their manufacture. Welding procedures, shielding flux, slags and gasses, effects of alloying elements. Metallurgy of carbon steel welds, metallography techniques. 2 lectures, 2 laboratories. Prerequisite: MET 235 and junior standing.

**ETWT 325 Welding Technology (4)**

Mechanical properties of metals, mechanical testing. Shrinkage and distortion in weldments, current preheating and postheating practices. Weldment defects, filler materials. Welding metallurgy of carbon and low alloy high strength steels. 2 lectures, 2 laboratories. Prerequisite: ETWT 324, ETWT 259.

**ETWT 326 Welding Technology (4)**

Weldability studies of alloy steels, AWS structural code welding procedure qualification of carbon and alloy steels. Metallographic and mechanical property tests. 2 lectures, 2 laboratories. Prerequisite: ETWT 325.

**ETWT 335 Nondestructive Examination (5)**

Theory and application of nondestructive test systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, eddy current and holography. 2 lectures, 3 laboratories. Prerequisite: ETWT 259, PHYS 123.

**ETWT 336 Welding Power Sources (3)**

Design, selection, and application of welding power sources. Physics of the welding arc as related to power sources. 2 lectures, 1 laboratory. Prerequisite: PHYS 123, ETEL 126.

**ETWT 434 Advanced Welding Technology (4)**

Procedure and performance qualification according to ASME Pressure Vessel Code. Weldability studies of aluminum and its alloys. Cost estimating and cost reduction methods. Basic pressure vessel design. 2 lectures, 2 laboratories. Prerequisite: CE 202, CE 203, ETWT 326, PHYS 123.

**ETWT 435 Advanced Welding Technology (4)**

Weldability studies on stainless steels and copper base alloys. Design of complex weldments. Introduction to corrosion. Cost estimating. Emphasis on semiautomatic and automatic welding processes. 2 lectures, 2 laboratories. Prerequisite: CHEM 121, ETWT 434.

**ETWT 436 Advanced Welding Technology (3)**

Welding tests, brazing qualifications, weldability of dissimilar metals, quench and tempered steels, welding chambers, electron beam welding. Lab emphasis on field welding and fitting. 1 lecture, 2 laboratories. Prerequisite: ETWT 435.

## FDSC—FOOD SCIENCE

**FDSC 111 Survey of Food Industry (2)**

Introductory course including size, distribution, major production areas of the food processing industry. Not open for credit to Food Science majors who have completed more than 12 units of FDSC courses. 2 lectures.

**FDSC 122 Introductory Food Engineering (4)**

Food processing equipment, mechanical principles, equipment maintenance, and basic control devices used in food processing and preparation of fruits and vegetables for further processing (preservation). 3 lectures, 1 laboratory. Prerequisite: Completion of high school algebra or equivalent.

**FDSC 150 Processed Food Inspection (3)**

Food laws and safety regulations concerning the food industry and consumer protection. Principles of food preservation. Fundamentals and procedures for inspecting processed foods based upon federal, state and industry standards. 3 lectures.

**FDSC 200 Special Problems for Undergraduates (1-2) (CR/NC)**

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading. Prerequisite: Consent of instructor.

**FDSC 209 Meat Procurement and Use (3)**

Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, nutritional value and related subjects. Meat inspection and grading. Credit not allowed for students having credit in FDSC 210. Students are required to meet sanitation and safety regulations in laboratories. 2 lectures, 1 laboratory.

**FDSC 210 Meats (3)**

Meat industry processing methods and operations. Practice in slaughtering and cutting beef, pork and lamb. Meat inspection, grading, composition, curing, preservation and related topics. Credit not allowed for students having credit in FDSC 209. Students are required to meet sanitation and safety regulations in processing laboratories. 2 lectures, 1 laboratory.

**FDSC 212 Meat Grading and Evaluation (2)**

Factors related to carcass quality and yield. USDA meat grading principles and practices. Judging of carcass and wholesale cuts. Field trip to meat packing plants required. 1 lecture, 1 laboratory. Prerequisite: FDSC 210.

**FDSC 230 Elements of Food Processing (4)**

GEB F.2.

Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and concentration. Food quality and spoilage. For non-food science majors only. Students are required to meet sanitation and safety regulations in processing laboratories. 3 lectures, 1 laboratory.

**FDSC 241 Unit Processing Operations: Thermal Processing (4)**

Thermal processing procedures for fruits, vegetables, meats and specialty items. Students are required to meet sanitation and safety regulations in processing laboratories. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 243 Unit Processing Operations: Refrigeration/Freezing and Osmotic Preservation (3)**

Processing procedures for frozen foods, juices, jams, jellies, specialty foods and by-product utilization. Students are required to meet sanitation and safety regulations in processing laboratories. Field trip may be required. 2 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 245 Unit Processing Operations: Water Removal (3)**

Processing procedures for dehydrated fruits, vegetables and specialty items, as well as the concentration of liquids. Students are required to meet sanitation and safety regulations in processing laboratories. Field trip may be required. 2 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 321 Food Quality Control (3)**

Methods of analyzing the physical and chemical properties of foods used in the food plant quality control and product development laboratory. Includes organization of the laboratory. 2 lectures, 1 laboratory. Prerequisite: CHEM 121.

**FDSC 331 Sanitation and Waste Disposal (3)**

Organization, management and operation of a food plant sanitation and waste disposal program. Field trips required. 3 lectures. Prerequisite: BACT 221.

**FDSC 332 Statistical Quality Control (3)**

Application of statistical methods in quality control programs and evaluation of operations. Calculator required. 3 lectures. Prerequisite: 12 units of 100–200 level FDSC courses or consent of instructor, completion of math requirements.

**FDSC 336 Packaging (3)**

Packaging materials, packages and packaging methods applicable to a variety of processed foods. Field trip may be required. 3 lectures. Prerequisite: 12 units of 100–200 level FDSC courses or consent of instructor.

**FDSC 338 Meat Processing (3)**

Manufacturing of further processed meats including curing, fermenting, restructuring, smoking and cooking. Product formulation, use of equipment and product evaluation. Field trip required. 2 lectures, 1 laboratory. Prerequisite: FDSC 210 or FDSC 209.

**FDSC 341 Wines and Fermented Foods (3)**

Methods of production and testing of beer, wines and fermented foods. Field trip may be required. 3 lectures. Prerequisite: Junior standing.

**FDSC 350 Advanced Food Engineering (3)**

Principles of material and energy balance as applied to food processing systems. Calculations regarding energy requirements, heat transfer, refrigeration and freezing systems, and pumping heads will be emphasized. Process control (materials handling and transportation). Identification of food processing control points and determination of methods of control, especially computers and microprocessors, will be stressed. 3 lectures. Prerequisite: FDSC 122, FDSC 150, FDSC 241, FDSC 243, and FDSC 245.

**FDSC 361 Meat Packing By-Products (2)**

Value, origin, classification and uses of meat by-products. Investigation of scientific principles and manufacturing processes. Field trips required. 1 lecture, 1 activity. Prerequisite: Junior standing, FDSC 210 or FDSC 209.

**FDSC 400 Special Problems for Advanced Undergraduates (1-2) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading. Prerequisite: Consent of instructor.

**FDSC 421 Advanced Food Processing (3)**

Food processing operations with problems involving physical and chemical action of the processes. Field trips may be required. 2 lectures, 1 laboratory. Prerequisite: FDSC 241, FDSC 243, FDSC 245.

**FDSC 422 Food Composition Science (4)**

Function and properties of carbohydrates, proteins, fats, pigments and other food ingredients used in the formulation and processing of foods. 3 lectures, 1 laboratory. Prerequisite: CHEM 121, FDSC 321 or consent of instructor.

**FDSC 425 Food Evaluation (3)**

Characteristics of food color, consistency, texture and flavor. Sensory evaluation and grading, food acceptance testing and statistical analysis of data. 2 lectures, 1 laboratory. Prerequisite: Junior standing and completion of math requirements.

**FDSC 431 Advanced Meats (3)**

Physical and chemical properties of meats and meat products. Quality control and special problems associated with the processing and distribution of meats. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FDSC 210 or FDSC 209.

**FDSC 433 Food Processing Management (3)**

Food plant layout and flow lines, evolutionary operations technique, unit cost accounting, work simplification and scheduling. 3 lectures. Prerequisite: Junior standing, FDSC 350.

**FDSC 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: FDSC 321, FDSC 332 and ENGL 215 or ENGL 218.

**FDSC 463 Undergraduate Seminar (2) (CR/NC)**

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**FDSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**FDSC 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**FDSC 581 Graduate Seminar in Food Processing (3)**

Current findings and research problems in the field and their application to the industry. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

**FIN—FINANCIAL MANAGEMENT****FIN 201 Survey of Securities Investments (3)**

Security types available for investment, sources of investment information, operation of security markets. Basic types of approach to investment determination, fundamental and technical approaches. 3 lectures.

**FIN 330 Real Estate Principles (4)**

Introduction to the field of real estate providing a basic background for further study. Includes legal aspects, financing, valuation, economics, public control, title insurance and escrow, closing, safeguards for the buyer of real estate, investment, and leasing. 4 lectures. Prerequisite: BUS 201 or BUS 207. Junior standing required.

**FIN 332 Real Estate Finance (4)**

Analysis of the relationship between national and local money markets. Real estate financing techniques, sources of funds, government participation, legal instruments of finance. 4 lectures. Prerequisite: FIN 330.

**FIN 334 Real Estate Investment (4)**

Effects of federal, state and local taxes on investment transactions. Intensive investigation and computer analysis of urban investment opportunities. Problems in exchanging and property management. 4 lectures. Prerequisite: FIN 330, FIN 332 recommended.

**FIN 342 Financial Management (4)**

Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. 4 lectures. Prerequisite: MATH 221. ACTG 301 recommended. Junior standing required.

**FIN 411 Security Analysis and Portfolio Management (4)**

Analysis of securities, markets, and valuation. Security price movements related to money and capital market factors and corporate events. Portfolio planning, risk, media, and objectives of individual and institutional investors. 4 lectures. Prerequisite: ECON 337, FIN 342, STAT 252.

**FIN 412 Law of Real Property (4)**

Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conventions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures.

## 390 FOR

### FIN 420 Management of Financial Institutions (4)

Analysis of practices and policies of financial institutions. Commercial banks, thrift institutions, insurance companies, investment bankers, and security dealers. Management policies resulting from the legal, competitive and economic environment in which each type of institution operates. 4 lectures. Prerequisite: ECON 337, FIN 342.

### FIN 430 International Business Finance (4)

Financial management of international business. Topics include the international capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures. Prerequisite: FIN 342.

### FIN 440 Commercial Bank Management (4)

Analysis of the management of a commercial bank as a profit-making entity. Emphasis put on cases in bank management, especially those which deal with the management of a bank's asset and liability structure. 4 lectures. Prerequisite: Senior standing, FIN 342, FIN 411, and ECON 337.

### FIN 466 Financial Management II (4)

Development of analytical and decision-making techniques in applying financial theory to business management problems. Cost of capital, capital structure, capital budgeting, risk and valuation theory. Analysis of cases to emphasize practical problems. 4 lectures. Prerequisite: FIN 342, ECON 337.

### FIN 480 Advanced Seminar in Investment (4)

Current topics in investments. An in-depth analysis of the efficient markets hypothesis and capital market theory. 4 seminars. Prerequisite: FIN 411.

## FOR—FOREST RESOURCES

### FOR 201 Forest Resources (3)

Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Multiple use of forest lands for water production, forage, recreation, wildlife, and timber. Laboratory activities to introduce students to forest tools, methods and techniques. 3 lectures.

### FOR 205 Fire Ecology (3)

Fire effects on the environment; prescribed use of fire in management; policy and objectives of fire management organizations. 2 lectures, 1 laboratory. Prerequisite: NRM 304, ecology course, or consent of instructor.

### FOR 208 Dendrology (4)

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees and shrubs in parks, forest and wildlife areas of the United States. Emphasis on Pacific Coast species. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

### FOR 303 Forest Protection (4)

Impact and losses to forested areas caused by physical and biotic agents other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

### FOR 305 Forest Harvesting (4)

Relationships between forest production and harvesting methods, preparation of timber harvest plans, site preparation, harvesting effects, and cost analysis of harvesting methods. Field trip between winter and spring quarters to visit timber operations. 3 lectures and required field trip. Prerequisite: Junior standing in Forest Resources Management concentration or consent of instructor.

**FOR 314 Forest Mensuration (5)**

Methods and principles of measurement for contents of trees, stands and felled timber, construction and use of volume tables, use of statistical measures, log scaling and sampling techniques. 3 lectures, 2 laboratories. Weekend field trips required. Prerequisite: MATH 120, STAT 212, and AE 237.

**FOR 316 Growth and Yield (3)**

Site, growth and yield mensuration and prediction; techniques of growth determination for plantations, even aged and all aged forests. Thinnings and growth response. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 314.

**FOR 332 Forest Products (3)**

Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. Weekend field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: PHYS 121, FOR 201, FOR 208.

**FOR 336 Forest Residue Utilization (2)**

Present and potential uses of residue produced by forest utilization. Mill and field residue for small to large scale operations included. Investigate technologies available and under development for increasing utilization standards. 1 lecture, 1 laboratory. Extended field trips required. Prerequisite: FOR 305, FOR 332.

**FOR 340 Resource Fire Control (4)**

Study of wildland fuels, fire weather, fire behavior, fire danger ratings, and fire suppression methods in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Saturday field trips may be required. 2 lectures, 2 laboratories. Prerequisite: FOR 201 or consent of instructor.

**FOR 345 Chaparral Management (4)**

Chaparral community management including composition, history of management, present management, future management alternatives and the effects of management on fire, water production, erosion and potential utilization of the biomass. 3 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

**FOR 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**FOR 407 Silviculture (4)**

Interaction of forest and chaparral plant communities within the environment; influence of external factors upon wildlands, particularly those suited to forestry practices; growth and development of individual plants; origin, development, cultural practices and tolerance of forest and chaparral plant communities. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 208.

**FOR 415 Forest Valuation (3)**

Wildland and timber appraisal, wildland taxation. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 2 lectures, 1 laboratory. Prerequisite: NRM 401, FOR 407.

**FOR 417 Forest Practices (4)**

Methods of organizing forest resources for sustained yield management; regulation of annual cut, determination of rotation and cutting cycles, and preparation of working plans. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 316, FOR 407.

**FOR 434 Tree Growth and Wood Properties (3)**

Physiology of wood formation, effects of hereditary and environmental factors on the structure, properties and uses of wood. 2 lectures, 1 laboratory. Prerequisite: FOR 201, FOR 208, and FOR 332.

**FOR 438, 439 Wood Energy Systems I, II (4) (4)**

Silvicultural aspects of biomass plantation systems. Evaluate species selection, soil, site and climatic requirements; design and implementation criteria for plantation growth, energy yield and measurement, harvest, utilization, combustion and conversion, economic, sociopolitical, institutional and environmental constraints. 2 lectures, 2 laboratories. Saturday field trips required. Prerequisite: FOR 336, FOR 407 and PHYS 122.

**FOR 440 Watershed Management (4)**

Introduction to concepts of the hydrologic cycle and measurement of its components. Analysis of streamflow with emphasis on surface water behavior as affected by land management practices. 3 lectures, 1 laboratory. Saturday field trips required. Prerequisite: SS 121 and NRM 304.

**FOR 441 Forest and Range Hydrology (3)**

Influence of forest and range vegetation on wildland water resources for optimum production and regulation of water yields. Hydrograph analysis. Erosion, sedimentation and other water quality aspects of land use; sampling techniques. 2 lectures, 1 laboratory. Prerequisite: FOR 440.

**FOR 442 Watershed Protection (3)**

Techniques for managing wildlands for increases in usable water yields and predicting impacts of land management practices. Watershed protection and rehabilitation; analytical evaluation and prediction of watershed disturbances. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 440.

**FOR 450, 451 Urban Forestry I, II (3) (3)**

Establishment and management of city forests, wood lots, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use. 2 lectures, 1 laboratory. Prerequisite: FOR 208.

**FOR 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**FOR 463 Undergraduate Seminar (2)**

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 2 seminars.

**FOR 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

**FOR 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**FOR 570 Selected Topics in Forest Resources (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 9 units. 1-3 lectures. Prerequisite: Graduate standing or consent of instructor.

**FORL—FOREIGN LANGUAGE****FORL 101, 102, 103 Foreign Language (3) (3) (3)****GEB C.3.**

Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Not open for credit by examination. To be taken in numerical sequence. 3 lectures.

**FORL 250 Potpourri of Languages (2)**

Opportunity to gain insight into some of the major world languages and their cultures. Language function, vocabulary, philosophy, culture, and brief linguistic aspects of such languages as French, German, Spanish, Mandarin Chinese, Japanese, and others will be stressed. Each language represented by a native speaker whenever possible. 2 lectures.



**FORL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**FR—FRENCH****FR 101, 102, 103 Elementary French (5) (5) (5)****GEB C.3.**

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. May not be taken for credit by native speakers or anyone who has previously studied French. 4 lectures, 1 activity.

**FR 104 Intensive Elementary French (15)**

Class practice in pronunciation, syntax, reading, writing and conversation including appropriate cultural information. Offered in summer only. Laboratory drill required. 15 lectures.

**FR 201, 202, 203 Intermediate French (3) (3) (3)****GEB C.3.**

Review of French grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. 2 lectures, 1 activity. Prerequisite: FR 103 or consent of instructor.

**FR 221, 222, 223 French Conversation (2) (2) (2)**

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement oral intensive classroom practice. 2 lectures. Prerequisite: FR 103 or consent of instructor. Simultaneous enrollment in FR 201, FR 202, FR 203 recommended.

**FR 301 Advanced French Composition and Grammar (3)**

Oral and written development of structural grammar syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Translation from English to French and written composition. 3 lectures. Prerequisite: FR 203 or equivalent.

**FR 305 Significant Writers in French (3)****GEB C.3.**

Understanding critical analysis and oral discussion of poetry, essays, novels, plays. Each course will have a subtitle descriptive of the content. May be repeated to 9 units. 3 lectures. Prerequisite: FR 203 or equivalent.

**FR 401 Techniques of Translation (4)**

Practice in translating from English to correct French and vice versa, eliminating unacceptable vocabulary, syntax and idiom influence from translated language. 3 lectures, 1 activity.

**FR 405 French Literature in English Translation (3)****GEB C.3.**

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding French writers. Lecture in English. Class schedule will list topics selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Consent of instructor.

**FR 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## FRSC—FRUIT SCIENCE

## FRSC 123 Bèekeeping (3)

Practical studies and exercises in the handling of honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Bee inspection and disease detection. 2 lectures, 1 laboratory.

## FRSC 131 Pomology (4)

History and outlook for California fruit growing. General principles of fruit production. Apple, fig, pear, quince, persimmon and pomegranate production practices. Field laboratories in orchard management practices, tree and fruit identification, harvesting, grading and packing of university orchard products. Field trip required. 3 lectures, 1 laboratory. Credit will not be allowed for both FRSC 131 and FRSC 230.

## FRSC 132 Pomology (4)

Mineral nutrition, orchard planning, and pruning of deciduous fruit trees. Apricot, cherry, peach, plum, prune, and olive culture. Saturday lab may be required. 3 lectures, 1 laboratory. Prerequisite: FRSC 131.

## FRSC 133 Pomology (4)

Production practices common to deciduous nut crops produced in California. Normal spring cultural problems including thinning and spraying. Small fruit culture. 3 lectures, 1 laboratory. Prerequisite: FRSC 132.

## FRSC 230 California Fruit Growing (4)

GEB F.2.

Production practices, areas of production, suitable varieties, harvest and processing of important deciduous and subtropical fruit crops. Methods of propagation and training. 3 lectures, 1 laboratory. Credit will not be allowed for both FRSC 131 and FRSC 230.

## FRSC 231 Viticulture (4)

Growing wine, raisin and table varieties of grapes. Techniques in harvesting and handling, utilizing the university planting. 3 lectures, 1 laboratory.

## FRSC 232 Fruit Plant Propagation (4)

Propagation by seed, cuttings, layering, grafting, and budding. Rootstocks for deciduous fruits, commercial nursery practices. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or FRSC 230.

## FRSC 324 Tropical Fruit and Nut Production (4)

Common practices in producing tree and fruit crops of economic importance in tropical areas—cocoa, tea, coffee, pineapple, mango, bananas, coconut, and papaya. 3 lectures, 1 activity.

## FRSC 331 Advanced Viticulture (4)

Commercial production practices, mechanization and processing. Utilization of university vineyards for propagation, planting, training and pruning of grape vines. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

## FRSC 332 Citrus and Avocado Fruit Production (4)

Growing and marketing oranges, lemons, grapefruit, tangerines, limes and avocados. Minor citrus species, rootstocks and ornamental types included. Orchard practice. Field trip to a major California production area required. 3 lectures, 1 laboratory.

## FRSC 421 Advanced Pomology (4)

Storage and transportation of fruits, postharvest physiology and technology, advanced methods of fruit production. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or consent of instructor.

## FRSC 436 Orchard Management (4)

Organization and management of labor and equipment in field and processing operations. Production problem analysis. Advanced work in production management. Job instruction training. 3 lectures, 1 laboratory. Prerequisite: FRSC 421.

**FRSC 521 Advanced Fruit and Nut Crop Production (4)**

Advanced commercial production and management techniques. Use of mechanical aids and harvesters as related to size of crops, harvesting, and post-harvest handling. 3 seminars, 1 laboratory. Prerequisite: Consent of instructor.

**FRSC 581 Graduate Seminar in Fruit Production (3)**

Group study of current problems of fruit production; current experimental and research findings as applied to production and marketing. 3 seminars.

**GEOG—GEOGRAPHY****GEOG 150 Human Geography (3)**

GEB D.4.a.

Introduction to the basic concepts and content of human geography. Survey of the field with emphasis on the cultural universals of language, religion, systems of government, and economic activities. 3 lectures.

**GEOG 215 Human Impact on the Earth (3)**

Global assessment of human impact upon vegetation, animals, soils, water and atmosphere. Emphasis on problems stemming from the interactions of technology, population growth and natural resources. 3 lectures.

**GEOG 250 Physical Geography (3)**

Emphasizes the origins of the Earth's physical diversity. Seeks to account for the distribution and interrelationships of the Earth's diverse patterns of climate, landforms, vegetation and soils. 3 lectures.

**GEOG 305 Political Geography (3)**

Spatial influences on man's political behavior. Geopolitics, boundaries, significance of resources on power politics, internal spatial structure of the nation-state, relationships between nation-states. 3 lectures. Prerequisite: Junior standing.

**GEOG 308 Global Geography (3)**

GEB D.4.b.

Survey of principal elements of global geography. Interrelations of human activities and natural elements as related to international developments and trends. Focus on selected regional examples. 3 lectures. Prerequisite: Junior standing.

**GEOG 310 Urban Geography (3)**

Presentation of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Location, areal extent, and interaction among the various urban functions. 3 lectures. Prerequisite: Junior standing.

**GEOG 315 Geography of Resource Utilization (3)**

World view of the interconnections of the following resource systems: food, energy, water and nonfuel minerals. Pervading theme: causes and characteristics of the great disparities in global living standards. 3 lectures. Prerequisite: Junior standing.

**GEOG 320 Geography of Hunger (3)**

Geographic analysis of the world problem of hunger that considers the factors of environmental deterioration, energy deficiencies, the Green Revolution, and rapid population growth. The emphasis will focus upon the underdeveloped world and the cultural and physical restraints it must overcome to adequately feed a growing population. 3 lectures. Prerequisite: Junior standing.

**GEOG 325 Climate and Humanity (3)**

Geographic perspective on the interrelationships between climate and humanity. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## 396 GEOL

### GEOG 340 Geography of California (3)

Physical environment of California; patterns of settlement and economic development; current problems. 3 lectures. Prerequisite: Junior standing.

### GEOG 350 Geography of the United States (3)

The people, land utilization, and economic development viewed against the background of the physical environment. Typically and regionally organized. Pervading themes include current problems and regional cultural distinctiveness. 3 lectures. Prerequisite: Junior standing.

### GEOG 401 Area Geography (3)

Detailed study of geographic characteristics of a selected world area. Each time the course is offered it will bear a subtitle descriptive of the particular world area studied. 3 lectures. May be repeated to a total of 12 units. Prerequisite: Junior standing.

### GEOG 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## GEOL—GEOLOGY

### GEOL 201 Physical Geology (3)

GEB B.1.a.

Processes responsible for the Earth's rocks, structure and surface features. Volcanism. Mountain building. Plate tectonics, weathering. Erosion and deposition by streams, glaciers, wind and waves. 3 lectures.

### GEOL 203 Introductory Paleontology (3)

GEB B.1.a.

The fossil record. Mechanisms and patterns of evolution. Adaptation of ancient organisms to their environments. Fossils in the interpretation of earth history. Important events in the history of life. Historical development of the major groups of invertebrates, vertebrates, and plants. 3 lectures.

### GEOL 204 Geologic History of California (3)

GEB B.1.a.

Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures. Prerequisite: GEOL 201 recommended.

### GEOL 205 Earthquakes and Earth Hazards (3)

GEB B.1.a.

Plate tectonics, seismicity and faulting. Quake mechanisms, intensity and magnitude. Measurement and prediction. History. Prevention and planning. Related geological effects. 3 lectures.

### GEOL 206 Geologic Excursions (1) (CR/NC)

GEB B.1.a. (see page )

Field trips to places of geologic interest. Class schedule will indicate destinations of the trips. Students provide their own transportation, food, and camping equipment. Course may be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading. 1 laboratory. Recommended prerequisite or concurrent: GEOL 201 or GEOL 204.

### GEOL 211 Cities and Geology (3)

GEB B.1.a.

Relation of city sites to geology. Planning and geology. Hydrogeology. Foundations of cities. Excavations. Building materials. Urban geological hazards. Case histories and lessons for the future. 3 lectures.

**GEOL 241 Physical Geology Laboratory (1)**

GEB B.1.a.

Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOL 201.

**GEOL 302 Geological Resources (3)**

GEB B.1.a.

Nature of the planet's natural mineral resources. Mode of occurrence, geology, origins and quantity of ores, fossil fuels, and industrial minerals. Exploration methods and prospecting. The world supply of geological resources. 3 lectures. Prerequisite: Introductory science course.

**GEOL 321 Marine Geology (4)**

Techniques of ocean floor exploration, nearshore sedimentary processes and shoreline evolution, continental margin sediments and geologic history, ocean floor topography and sediments, origin and evolution of ocean basins, physical resources of the ocean. 3 lectures, 1 activity. Prerequisite: GEOL 201 or consent of instructor.

## GER—GERMAN

**GER 101, 102, 103 Elementary German (5) (5) (5)**

GEB C.3.

For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures, 1 activity.

**GER 201, 202, 203 Intermediate German (3) (3) (3)**

GEB C.3.

Review of German grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. 2 lectures, 1 activity. Prerequisite: GER 103 or consent of instructor. Simultaneous enrollment in GER 221, GER 222, GER 223 recommended.

**GER 221, 222, 223 German Conversation (2) (2) (2)**

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement intensive oral classroom practice. 2 lectures. Prerequisite: GER 103 or consent of instructor. Simultaneous enrollment in GER 201, GER 202, GER 203 recommended.

**GER 301, 302 Reading and Translation Skills (4) (4)**

Students read and translate texts relating specifically to their own disciplines. A structural and grammatical approach with concentration on the further development of a specialized vocabulary. 3 lectures, 1 activity.

**GER 305 Significant Writers in German (4)**

GEB C.3.

Representative writers or literary period. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 4 lectures. Prerequisite: GER 203 or equivalent, or consent of instructor.

**GER 405 German Literature in English Translation (3)**

GEB C.3.

Study of selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German writers. Lecture in English. Class schedule will list topics selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Consent of instructor.

**GER 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## GRC—GRAPHIC COMMUNICATIONS

**GRC 101 Introduction to Graphic Communications (2)**

Orientation to the Graphic Communications program. Examination of the industry, its traditions, technological changes, and employment opportunities. 2 lectures.

**GRC 111 Substrates and Ink (4)**

Manufacturing processes. Testing, procurement, pricing, paper classifications and measurement. Application to end use. 3 lectures, 1 activity.

**GRC 122 Design with Type (5)**

Introduction to typography. Type classification, identification, and selection. Copyfitting, markup systems, and proofreading. Fundamentals of layout and design for print media. 3 lectures, 2 laboratories.

**GRC 123 Binding and Finishing (3)**

Effective imposition techniques. Cutting, folding, assembling of folded material, finishing operations. Case and perfect bookbinding. 2 lectures, 1 laboratory.

**GRC 127 Graphic Arts Processes (3)**

Introduction to the graphic arts. Printing processes, design, layout, composition, presswork, cold type, binding, silk screen, offset, photography, and duplicating processes. For nonmajors. Miscellaneous course fee required— see Class Schedule. 2 lectures, 1 laboratory.

**GRC 132 Letterpress and Relief Specialities (3)**

Principles and applications of the letterpress printing process. Theoretical and operational uses of the die cutting, scoring, creasing, foil stamping and embossing techniques. 1 lecture, 2 laboratories.

**GRC 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**GRC 204 Introduction to Printing Management (3)**

Structure of the industry. Production systems analysis, trade customs, and applied management. 3 lectures.

**GRC 222 Advanced Design with Type (3)**

Typographic principles, practice and design of complex text, display and tabular composition for mass print media. Copy markup and layout procedures for electronic composition, with consideration of printing process requirements. 2 lectures, 1 laboratory. Prerequisite: GRC 122.

**GRC 223 Copy Preparation (3)**

Preparation of line and tone copy for the reproduction processes. Designing roughs and visuals and preparation of single- and multi-color mechanicals. Production planning. 2 lectures, 1 laboratory.

**GRC 224 Composition Systems I (2)**

Introduction to composition systems. Electronic terminal entry of newspaper, commercial, publishing and packaging composition. Methods and operating characteristics of photocomposition typesetting equipment. 1 lecture, 1 laboratory. Prerequisite: GRC 122 or consent of instructor.

**GRC 227 Process Camera (5)**

Characteristics of photographic materials and equipment for the graphic arts. Theory and practice in the use of the process camera for line, halftone and color separation photography. Densitometry. Sensitometry. 2 lectures, 3 laboratories. Prerequisite: Sophomore standing or consent of instructor.

**GRC 228 Image Assembly and Platemaking (4)**

Planning for lithographic press plates. Ruling, scribing, opaquing, and retouching negatives and positives. Preparation of supports for black and white and color imaging. Image assembly for large presses. Black and white and color proofing techniques. Preparation of various offset plates. 2 lectures, 2 laboratories. Prerequisite: GRC 227 or consent of instructor.

**GRC 229 Sheetfed Offset Lithographic Presswork (5)**

Theory and practice in the use of sheetfed lithographic presses. Investigation of equipment designs and systems. Applications to commercial, reprographic packaging, publishing and specialty fields. Press quality control, sheet evaluation, color printing, equipment acquisition/disposal, automated control. 3 lectures, 2 laboratories. Prerequisite: GRC 228 or consent of instructor.

**GRC 301 Composition Systems II (4)**

Modern composition systems for display and text. First and second generation phototypesetting machines. Computerized photocomposition systems. 2 lectures, 2 laboratories. Prerequisite: GRC 224.

**GRC 302 Technical Basics for Printing (3)**

Application of electronics, optics, and other selected areas of science and technology in the printing and publishing industries. Advanced instrumentation, control, actuation, and systematization for graphic arts operations. 3 lectures.

**GRC 303 Estimating (4)**

Estimating the cost of various kinds of printed products. Analysis of material, labor and other cost factors. Use of budgeted hour costs and production standards. Computer assisted estimating. 3 lectures, 1 laboratory. Prerequisite: GRC 111 or junior standing.

**GRC 323 Pre-Separated Art for Camera (3)**

Manual preparation and separation of line and continuous tone images for multicolor reproduction. Preparation of complex full-color mechanical layouts. 1 lecture, 2 activities. Prerequisite: GRC 223.

**GRC 326 Printing Equipment Management (3)**

Procedures in designing, maintaining and decision making for printing equipment including pneumatics, hydraulics, mechanical and electrical systems. Pollution, safety and training in the graphic communications industry. 2 lectures, 1 activity. Prerequisite: GRC 204 and junior standing.

**GRC 330 Packaging Materials and Substrates (3)**

Investigation of packaging materials and substrate applications for consumer, industrial, and military packaging. Paper, paperboard, plastic, metal, glass, laminates, and other applicable materials. Physical testing and characteristics. Graphic design implementation of each substrate. 2 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

**GRC 333 Plant Organization and Layout (3)**

Printing plant design and layout. Production analysis, work flow patterns, and utilization of space. Organization of plant services. 2 lectures, 1 activity.

**GRC 335 Line and Halftone Media (4)**

Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing and layout for single and multiple color runs. Study of various approaches to registration; uses of color and texture in art copy. 2 lectures, 2 laboratories. Prerequisite: GRC 323 or consent of instructor.

**GRC 336 Modern Copy Technology (4)**

Preparation and evaluation of current and experimental typographic images for the major printing processes; pagination and typographic modification by electronic means. 2 lectures, 2 laboratories. Prerequisite: GRC 301, GRC 335.

**GRC 347 Electronic Copy Production (2)**

Preparing text and display copy for entry into video display terminals. Editing and copy revision techniques, system analysis of stand-alone and on-line devices. Entry to photocomposition systems and advertising display terminals. 1 lecture, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

**GRC 357 Screen Processes (2)**

Screen process reproduction methods with applications to industry and communications. Includes paper, tusche, knife-cut and photographic stencils. Printing mediums, surfaces, and industrial applications such as printed circuits and packaging. Miscellaneous course fee required—see Class Schedule. 2 laboratories. Prerequisite: GRC 228 or consent of instructor.

**GRC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**GRC 401 Printing Sales (3)**

Sales management, salesmanship, sales forecasting techniques, and marketing of printed products. 3 lectures. Prerequisite: Senior or advanced junior standing.

**GRC 408 Newspaper and Publications Management (3)**

Analysis of newspaper and publications production systems. Organization of the production function. Personnel and industrial problems peculiar to the industry. 2 lectures, 1 laboratory. Prerequisite: Senior standing or consent of instructor.

**GRC 411 Estimating, Pricing and Costing (4)**

Development of printing plant estimating standards. Coordination of estimating and sales to printing market trends. Printing industry management ratios related to management and profit strategy. Costing techniques in the printing plant. Estimating for web processes including color impositions. Computer applications to estimating. 4 lectures. Prerequisite: GRC 303.

**GRC 416 Web Printing Technology (5)**

Theory and practice in the use of web presses for letterpress, offset, rotogravure, and flexographic printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and advertising materials. 3 lectures, 2 laboratories. Prerequisite: GRC 229.

**GRC 417 Advanced Web Printing Technology (2)**

Advanced theory and applications of web printing technology to include copy and design reproduction and management decisions as they pertain to the graphic communications field. 2 lectures. Prerequisite: GRC 223, GRC 416.

**GRC 421 Printing Management (4)**

Principles and applications of printing production forecasting. Functions of printing production control. Printing production records. Establishment of inspection standards. Judgment and measurement inspection. 3 lectures, 1 activity. Prerequisite: GRC 204.

**GRC 422 Printing Management (3)**

Applied techniques of printing plant personnel management. Investigation and determination of job descriptions, testing for staff and line employees. Setup of graphic arts in-plant training programs. Evaluation procedures for personnel working in the printing facility. Printing industry association relationships. 3 lectures. Prerequisite: GRC 204.



**GRC 423 Printing Management (4)**

Trends in the graphic arts labor movement. Graphic arts labor unions. Collective bargaining and grievance procedures practiced in the printing industry. Administration of the labor contract by printing plant supervisor. Study of industry-specific case problems. 3 lectures, 1 activity. Prerequisite: GRC 204.

**GRC 429 Advanced Composition Systems (3)**

CRT composition, character generation, pagination, and computer utilization in modern graphic arts composition. 2 lectures, 1 laboratory. Prerequisite: GRC 301.

**GRC 431 Package Estimating (3)**

Principles of packaging, economics and cost determination. Establishment of unit cost, subcontracting, overhead and profit. Estimating costs of converting operations. 3 lectures. Prerequisite: GRC 330 or consent of instructor.

**GRC 437 Consumer Packaging (3)**

Consumer requirements including utility and protection. Consumer motivation. Graphics, size, shape, and legal ramifications. 2 lectures, 1 activity. Prerequisite: MKTG 204, GRC 431 or consent of instructor.

**GRC 439 Advanced Line and Halftone Media (4)**

Complex and experimental copy and art preparation and their limitations for use in line and halftone reproduction by gravure and offset lithography. Mechanical requirements; production procedures. 2 lectures, 2 laboratories. Prerequisite: GRC 336, GRC 417.

**GRC 440 Advanced Copy Technology (4)**

Complex copy preparation in line, tone and color for reproduction by flexography and letterpress (relief) printing; print production requirements for highspeed reproduction presses. 2 lectures, 2 laboratories. Prerequisite: GRC 439.

**GRC 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 60 hours total time. Prerequisite: Senior standing.

**GRC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**GSB—GRADUATE STUDIES—BUSINESS****GSB 511 Financial Accounting (4)**

Financial accounting model and accounting systems concepts. Major goal is understanding the preparation and content of various financial statements and the interrelationships among those statements. 4 seminars.

**GSB 512 Foundations for Quantitative Analysis (4)**

Basic quantitative concepts used in the MBA program: matrices, linear systems of equations, introduction to calculus, probability, basic statistical concepts and regression. Use of the computer for solution of problems in these areas is an integral part of the course. 4 seminars.

**GSB 513 Organizations and Management (4)**

Examination of major theories and conceptual constructs relating to the operating requirements of complex organizations, including manufacturing, service, and nonprofit organizations; historical development of theory and practice; managerial behavior functions and processes. Current issues and actual cases. 4 seminars.

**GSB 514 Management in an International Environment (4)**

Impact of international factors on management. Organizational behavioral strategies in the context of differential economic, technological, political and cultural environments. 4 seminars.

**GSB 521 Accounting for Management Planning and Control (4)**

Uses of accounting data as a basis for planning control. Development of an operational understanding of cost systems, budgeting concepts, transfer pricing, performance evaluation, and other quantitative accounting techniques. Use of accounting data in computer modeling applications. 4 seminars.

**GSB 522 Quantitative Business Analysis I (4)**

Concepts and techniques of quantitative methods relating to management planning and decision making. Primarily deals with optimization techniques and various types of mathematical programming. Use of campus computer facilities as appropriate. 4 seminars.

**GSB 523 Managerial Economics (4)**

Microeconomic analysis and its application to business decisions. Topics covered include market structures, pricing strategies, cost analysis and input selection. Examination of the economic impact of various governmental policies on the business firm. 4 seminars.

**GSB 524 Marketing Management (4)**

Introduction to marketing management. The concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 seminars.

**GSB 531 Managerial Finance (4)**

Theories, practices and tools of financial decision making. Topics include financial statement analysis, financial forecasting, valuation, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. 4 seminars.

**GSB 532 Quantitative Business Analysis II (4)**

Concepts and techniques of quantitative methods, relating to management planning and decision making. Focus on the analysis of decisions under uncertainty using methods of probability and statistics. Use of campus computer facilities as appropriate. 4 seminars.

**GSB 533 Aggregate Economic Analysis and Policy (4)**

Theoretical framework and empirical dimensions of the aggregate economic environment in which business enterprise must operate. Understanding of national income accounting, monetary and fiscal policies, inflation, unemployment and balance of payments issues in static and dynamic contexts. Develops an ability to understand macroeconomic events in an evolving and interconnected world economy. 4 seminars.

**GSB 534 Operations Management (4)**

Production function and its interaction with other functional areas in an organization. Application of quantitative and statistics methods to planning, control and decision making in operations management. Topics include economics of plant location, logistics, material management, and quality control. 4 seminars.

**GSB 541 Organizational Behavior (4)**

Examination of major psychological and sociological theories and conceptual constructs relating to behavior in modern organizations. Leadership styles, group dynamics, motivation, communication, perception, conflict resolution and attitude change as related to organizational effectiveness and performance. 4 seminars.

**GSB 542 Market Research and Planning (4)**

Makes the student a knowledgeable user of marketing research information to develop and implement marketing plans. Emphasis on development of ability using research information to formulate marketing objectives and strategies and to analyze marketing problems in depth. 4 seminars.

**GSB 543 Business, Government and Society (4)**

Analysis from social, economic, political, legal and ethical perspectives of the changing domestic environment within which the American business enterprise operates. 4 seminars.

**GSB 551 Organizational Analysis, Planning and Decision Making (4)**

Organizational strategy analysis and constructs; environmental, technological and behavioral factors influencing organizational objectives, structures and design; strategic and tactical planning concepts and decision making criteria relating to business, governmental and non-profit organizations. 4 seminars.

**GSB 552 Financial Analysis and Planning (4)**

Application of financial theory and models to a variety of financial problems. Analysis and formulation of financial plans developed primarily through the use of cases and other real world examples. The primary areas of emphasis are: working capital management, investment decision under conditions of risk, and financing and capital structure decisions. 4 seminars.

**GSB 561 Organizational Change and Development (4)**

Application of behavioral science to the improvement of organizational effectiveness. Personal growth and goal setting, interpersonal relationships, team development and intergroup conflicts. Design and use of action programs to accomplish organizational change and development. 4 seminars.

**GSB 562 Business Strategy and Policy (4)**

Integration of total organization imperatives. Case studies and analysis of problems faced by top management. Strategy and policy formulation as affected by environmental factors, competition, technological development, growth objectives and organizational capabilities. Appraisal of total performance and alternative strategies. 4 seminars.

**GSB 570 Planning and the Process of Choice (4)**

Planning and choice determination concepts and criteria relating to industrial, governmental and nonprofit environments. Problem definition, diagnostic analysis, causation analysis, alternative formulation and optimization criteria and techniques. 4 seminars.

**GSB 571 Seminar in Complex Organizations (4)**

Systems approach to understanding total organizational effectiveness. Structural, economic, political and behavioral analysis of organizations. Research and investigation of special problems to develop better understanding of how complex organizations function. 4 seminars.

**GSB 574 Seminar in Labor Relations (4)**

Labor relations and collective bargaining in the public and private sector. Relationships between unions, organizations and the government and an understanding of the causes of conflict and ways to resolve it. Emphasis on current practices, procedures and laws. 4 seminars.

**GSB 576 Information Systems for Decision Support (4)**

Overviews of management information systems and decision support systems. Impact of computers on society. Process of information systems development. File processing and integrated data base concept. Data communication and on line distributed systems. Management decision making using computer software packages. Report generation using word processing system. Interactive financial planning systems and the decision support systems. 4 seminars.

**GSB 577 Quantitative Business Analysis III (4)**

Case studies using the concepts of Quantitative Business Analysis I and II applied to selected problems in business and industry. These involve concepts of linear programming, quadratic programming, goal programming and advanced forecasting concepts. Solutions of these models obtained using the resident computer system. 4 seminars.

**GSB 578 Operations Planning and Control (4)**

Basic concepts of designing control systems for operating environments of many types. Forecasting, operations planning, inventory planning and control, operations scheduling and dispatching and progress control with special emphasis on the application of the computer and the potential of materials equipment planning. 4 seminars.

**GSB 580 Industrial Marketing (4)**

Marketing of business goods and services to other businesses, governmental agencies and social institutions by the manufacturer. Market analysis, sales forecasting, product strategy, effective use of sales force and industrial advertising media. 4 seminars.

**GSB 581 Marketing Management Seminar (4)**

Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 seminars.

**GSB 585 Seminar in Investments (4)**

Stock, bond and options market. Emphasis on operations of markets, the efficient markets hypothesis and portfolio theory. Setting investment objectives and managing portfolios given efficient capital markets. 4 seminars.

**GSB 586 Financial Institutions and Markets (4)**

Structure of money and capital markets and the financial institutions that operate in these markets. Evaluation of contemporary thought on the evolving market and institutional arrangements. Emphasis on the management policies of the institution. 4 seminars.

**GSB 589 Accounting Policy (4)**

Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the establishment and maintenance of appropriate internal systems for planning, reporting and control. 4 seminars.

**GSB 591 Industry Analysis (4)**

In-depth study of major industry using analytical tools developed in prerequisite courses. Intensive investigation of the dynamic environment, markets, technology, financial and economic structures, history and other key factors. Further prospects for the industry explored through preparation of a comprehensive forecast. 4 seminars.

**GSB 594 Future of Business (4)**

Examination of the techniques and conclusions of representative future studies by research institutions such as the Rand Corporation, Hudson Institute and The Club of Rome. Analysis of the implications of those conclusions for the operations and role of business in society. 4 seminars.

**GSB 595 Legal Aspects of Management and the Market System (4)**

Managerial approach to important legal issues affecting business and the market system. Focus on those aspects of law which affect managers directly including contracts, products liability and corporations in perspective; principles of partnership authority, liability, and control; managerial duty and liability to the corporation; public control of managerial activity. 4 seminars.

**GSB 596 Economic Forecasting (4)**

Applications to small business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins analysis, adaptive filtering models, leading indicators and input/output analysis. 4 seminars.

**GSB 597 Seminar in Selected Economic Problems (4)**

Selected problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or transportation. 4 seminars.

**GSB 599 Individual Research (1-4)**

Advanced individual research planned and completed under the direction of a member of the school faculty. Designed to meet the needs of qualified students who wish to pursue investigations which they cannot follow effectively in regularly offered elective courses.

**HE—HOME ECONOMICS****HE 101 Home Economics as a Profession (2) (CR/NC)**

Exploration of professional opportunities available in home economics; advantages, disadvantages and the personal and professional qualifications required. Credit/No Credit grading only. 2 lectures.

**HE 121 Fundamentals of Food (4) (Also listed as DFA 121)**

Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 three-hour laboratory. Prerequisite: CHEM 121.

**HE 122 Design Analysis (3)**

Design elements and principles as they apply to all areas of home economics. 2 lectures, 1 two-hour laboratory.

**HE 131 Clothing Construction (3)**

Basic techniques in clothing construction. Emphasis on pattern and fabric selection, fit and quality construction. 1 lecture, 2 three-hour laboratories.

**HE 200 Special Problems for Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**HE 203 Consumer Role of the Family (3)**

Study of the individual and family as consumers in the marketplace. Sources of consumer protection and recourse. Influence of selected management concepts on consumption patterns. 3 lectures.

**HE 207 Problems of Family Housing (3)**

Analysis of the changing processes of producing, purchasing and regulating family housing. Emphasis on consumer housing problems. 3 lectures. Prerequisite: Sophomore standing, one course in sociology and one course in economics recommended.

**HE 210 Nutrition (3) (Also listed as DFA 210)**

GEB E.2.

Nutritional needs throughout the life cycle. Chemical composition of foods and their utilization in the body. 3 lectures.

**HE 220 Contemporary Textile Products (3)**

Selection, use and care of carpets, draperies, upholstery, linens and outdoor textile products. Legislation as it affects consumers and the industry. 3 lectures.

**HE 224 Creative Textiles (2)**

Exploration and development of creative textiles through demonstrations and laboratory experiences. 2 three-hour laboratories. Prerequisite: HE 122 or consent of instructor.

**HE 225 Textile Development and Dyeing (2)**

Development of textiles by use of various fibers; dyeing processes, and construction through demonstrations and laboratory experiences. 2 three-hour laboratories. Prerequisite: HE 122 or consent of instructor.

**HE 226 Home Food Conservation (2) (Also listed as DFA 226)**

Conservation techniques to obtain maximum control of food quality with most efficient use of time, energy, and economic resources. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 two-hour laboratory. Prerequisite: HE 121.

**HE 237 Clothing and the Individual (2)**

Apparel for individuals in various stages of the life cycle. Emphasis on availability, selection, and construction of garments to meet developmental, psychological, and economic needs. 2 lectures.

**HE 238 Clothing and the Individual: Laboratory (1)**

Construction of garments to meet needs of various stages of the life cycle. 1 three-hour laboratory. Prerequisite: HE 131 or consent of instructor. Concurrent enrollment in HE 237 required.

**HE 241 Flat Pattern (3)**

Principles of designing by drafting and flat pattern methods. Development of production patterns for selected designs. Advanced fitting techniques. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 122 and HE 131 or consent of instructor.

**HE 242 Interior Design (4)**

Basic interior design: visual, functional, and economic aspects of planning interior space. Laboratory experience in solving realistic design problems. 3 lectures, 1 two-hour laboratory. Prerequisite: HE 122 or consent of instructor.

**HE 309 History of Interior Design (3)**

Development of furniture styles and their environments through the Nineteenth century. 3 lectures. Prerequisite: Junior standing.

**HE 310 Maternal and Child Nutrition (3) (Also listed as DFA 310)**

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: HE 210.

**HE 311 History of Interior Design Laboratory (2)**

Application of historical interior backgrounds and furnishings in contemporary residential design. 2 three-hour laboratories. Prerequisite or concurrent: HE 309.

**HE 315 Textiles and Clothing Industries (3)**

Commercial aspects of design, production and distribution of textiles and clothing. External influences which affect the fashion industry. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HE 321 Meal Management (3) (Also listed as DFA 321)**

Factors and principles involved in the choice, purchase and preparation of foods for a meal. Application of management principles in the use of time, energy and money in relation to feeding the family. Planning, preparing and serving of meals with emphasis on nutritional, aesthetic, economic and cultural aspects of food. 1 lecture, 2 two-hour laboratories. Prerequisites: HE 121, HE 122, HE 210.

**HE 322 Textiles (3)**

Physical and chemical characteristics of natural and synthetic fibers. Laboratory application of theory in understanding properties of fibers, yarns, fabrics, and finishes as related to the selection, use and care of textiles. 2 lectures, 1 three-hour laboratory. Prerequisite: CHEM 122 or consent of instructor.

**HE 323 Individual Residential Design (4)**

Design decisions creating an interior and exterior environment expressive of social, functional and aesthetic needs as applied to a mass produced housing unit. 2 lectures, 2 three-hour laboratories. Prerequisite: HE 207, 344 or consent of instructor.

**HE 324 Management of Family Resources (3)**

Application of ecosystem framework as related to contemporary aspects of family and group living management. Analysis of selected resource management areas. 3 lectures. Prerequisite: HE 203, or consent of instructor.

**HE 326 Demonstration Techniques (3)**

Development of effective means of communication by use of the demonstration technique, through presentations with evaluations. 3 two-hour laboratories. Prerequisite: SPC 201, HE 331 or consent of instructor.

**HE 331 Household Equipment (4)**

Principles involved in construction, operation, energy consumption, selection, safety, and space utilization of household equipment. 3 lectures, 1 two-hour laboratory. Prerequisite: Junior standing.

**HE 333 Apparel Design by Draping (3)**

Draping fundamentals as one element of the apparel design production process. Designing for the individual and the fabric. Miscellaneous course fee required—see Class Schedule. 3 two-hour laboratories. Prerequisite: HE 241 or consent of instructor.

**HE 334 Special Fabrics (3)**

Interrelationships among fabric, care, design, and construction of apparel. Evaluation of ready-to-wear. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: HE 131, HE 322.

**HE 341 Dynamics of Clothing (3)**

Socio-psychological, economic and aesthetic aspects of clothing as related to human behavior. 3 lectures. Prerequisite: One course in psychology, SOC 105.

**HE 344 Interior Design Materials and Techniques (3)**

Survey of materials used for interior surfaces. Practical experiences in specification writing and custom design. Basic interior design business procedures. Total credit limited to 6 units. 1 lecture, 2 three-hour laboratories. Prerequisite: HE 220, HE 242, or consent of instructor.

**HE 400 Special Problems for Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing and consent of instructor.

**HE 401 Occupational Training Seminar (3)**

Current developments in the teaching of vocational, home economics-related occupations at the secondary level. 3 seminars. Prerequisite: Senior standing or consent of instructor.

**HE 404 Seminar in Financial Responsibilities of the Family (3)**

Economic role of the family: factors affecting use of income; cost of goods and services within the U.S. economic system. Opportunity to analyze and make decisions concerning families' financial situations and understand how their specific socio-economic levels relate to other families. 3 seminars. Prerequisite: HE 324 or consent of instructor.

**HE 407 Seminar in Family Housing Trends (3)**

Housing industry trends in construction and mass marketing as they affect the practice of professional residential interior design. 3 seminars. Prerequisite: HE 207 or consent of instructor.

**HE 411 Teaching Methods in Home Economics (3)**

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community or clinic setting. 2 lectures, 1 laboratory. Prerequisite: ED 305 or consent of instructor.

**HE 412 Home Economics Student Teaching Seminar (3)**

Practices and problems of student teaching in home economics. Synthesizes professional study and experience to develop teaching competence. Taken concurrently with student teaching. 3 seminars.

**HE 415 Methods of Teaching Nutrition (3) (Also listed as DFA 415)**

Identification of nutrition learning needs and problems at various stages of the life cycle. Selection of valid content and learning activities for a variety of teaching situations and strategies in community, classroom and clinic. 3 lectures. Prerequisite: DFA 328 and ED 305, and senior standing.

**HE 420 Fashion Merchandising (3)**

Planning, buying, and selling of fashion merchandise through various distribution channels. Retailer development, organization, operations, and image. Promotion, advertising, and visual display. 3 lectures. Prerequisite: HE 122, HE 203, ECON 201, MKTG 204 and MKTG 301 or MKTG 302 suggested.

**HE 421 Cultural and Aesthetic Aspects of Food (3) (Also listed as DFA 421)**

Study of psychological, sociological and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 321 or consent of instructor.

**HE 423 Clothing for Disabled People (3)**

Analysis and discussion of designs and functions of clothing as related to special needs of people with physical differences. 3 seminars. Prerequisite: HE 241, HE 322 or consent of instructor.

**HE 430 Advanced Textiles (2)**

Seminar in advanced textiles including fiber structure, fabrics and finishes as related to textile performance. Review and reporting of student independent investigations. 2 seminars. Prerequisite: HE 322.

**HE 431 Advanced Textiles Laboratory (1)**

Advanced study of fiber structure, fabrics and finishes through laboratory experimentation. Individual and group research on fabric performance. Taken concurrently with HE 430. 1 three-hour laboratory. Prerequisite: HE 322.

**HE 432 Advanced Interior Design (3)**

Individual research and creative experiences in interior design. Total credit limited to 9 units. 3 three-hour laboratories. Prerequisite: HE 309, HE 323, EDES 111 or consent of instructor.

**HE 433 Historic Costume (3)**

Chronological study of garment designs as related to dominant cultural influences. 3 lectures.

**HE 435 Seminar in Trends and Developments in Interior Design (3)**

New developments in interior design. Examination of the social and economic factors affecting Twentieth century design trends. Individual research. 3 seminars. Prerequisite: Senior standing or consent of instructor.

**HE 440 Internship (1-12) (CR/NC)**

Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading. Prerequisite: Junior standing and consent of instructor.

**HE 442 Tailoring (2)**

Traditional and contemporary tailoring techniques as applied to garment construction and selection. 2 three-hour laboratories. Prerequisite: HE 241, 322, or consent of instructor.

**HE 461, 462 Senior Project (3) (3)**

Selection and completion of research related to the student's area of interest. The project requires a formal report which must follow department guidelines. Minimum of 180 hours required. Prerequisite: ENGL 215 or ENGL 218. Completion of 135 quarter units including all freshman, sophomore, and junior classes in the area of study.



**HE 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of individual capabilities, values, academic preparation as they relate to the career process; implications of current social issues for the profession. Recommended enrollment three quarters prior to graduation. 2 seminars. Credit/No Credit grading only. Prerequisite: Senior standing in major.

**HE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. Miscellaneous course fee may be required—see Class Schedule. 1 to 3 lectures. Prerequisite: Consent of instructor.

**HE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 6 units. 1 to 3 three-hour laboratories. Prerequisite: Consent of instructor.

**HE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate program coordinator, and supervising faculty member.

**HE 511 Research Design (3)**

Methods of research and critical analysis of scientific literature and problems in home economics. 3 seminars. Prerequisite: Graduate standing.

**HE 525 Experimental Studies in Textiles (3)**

Review and reporting of current developments in textiles; study and analysis of pertinent literature. Application through laboratory testing; individual and group research. 2 seminars, 1 three-hour laboratory. Prerequisite: Graduate standing and HE 422 or consent of instructor.

**HE 528 Experimental Studies in Foods (2)**

Experimental approach to the study of chemical and physical properties of interacting components of selected foods; correlated emphasis on selection, application, and evaluation of pertinent literature. 1 seminar, 1 two-hour laboratory. Total credit limited to 4 units. Prerequisite: Graduate standing or consent of instructor.

**HE 536 Experimental Studies in Household Equipment (3)**

Development of professional and consumer criteria to improve evaluation of household appliances. Current research and techniques for investigations with home equipment. 2 seminars, 1 three-hour laboratory. Prerequisite: Graduate standing and HE 331 or consent of instructor.

**HE 580 Seminar (1-3)**

Advanced study of current issues and topics significant for professional home economists. Class schedule will list topics selected. 1-3 seminars. Prerequisite: Graduate standing.

**HE 599 Thesis (3) (3) (3)**

Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing.

## HIST—HISTORY

### HIST 101, 102, 103 History of Western Civilization (3) (3) (3)

Development of western civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

### HIST 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### HIST 201, 202, 203 United States History (3) (3) (3)

GEB D.1.

Comprehensive survey of the development of the United States from the 15th century to the present. HIST 201 satisfies the general education requirement of HIST 204 for History majors. 3 lectures.

### HIST 204 Growth of American Democracy (3)

GEB D.1.

Historic backgrounds of present-day economic, political, and social problems. Development of American institutions and ideals. Not open to students with credit in or enrolled in HIST 203. 3 lectures.

### HIST 205 The United States in World Affairs (3)

Origin, nature, and implementation of U.S. foreign policy since the Second World War. Domestic and international factors relating to U.S. objectives; discussion and analysis of major issues and problems of contemporary U.S. foreign policy. 3 lectures.

### HIST 206 American Democracy and World Affairs (5)

Combines HIST 204 and 205. Historical significance of American institutions and ideals and the increasing involvement of the United States in world affairs. Not open to students with credit in or enrolled in HIST 203, 204, or 205. 5 lectures.

### HIST 221 Historical Craft (3)

Introduction to research and writing methods in history; seminar approach to the craft of history. Topics: nature of historical research, research methods, library facilities, basic bibliography and organization skills, writing techniques. 3 seminars.

### HIST 270 History through Film (3)

Various historical themes examined through the medium of film. Influence and overall relationship of films to the societies that produced them examined. May be repeated to 6 units. 2 lectures, 1 laboratory.

### HIST 285 Vietnam War at Home and Abroad (3)

Role of U.S. foreign policy in the transformation of the Vietnamese revolution from a colonial insurrection into a multinational conflict. Interaction of public opinion, electoral politics with foreign policy formulation and military strategy analyzed. 3 lectures.

**HIST 301 Historiography (3)**

Theory, interpretation and philosophies of history. 3 seminars. Prerequisite: HIST 221 and junior standing.

**HIST 303 Historical Modernization in Europe and Asia (4)**

A comparative analysis of traditional/feudal societies in Europe and Asia and their transformation under the force of commercial and industrial capitalism to produce three alternative models of modernization: democracy, fascism, and communism. 4 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 305 History of American Agriculture (3)**

Agricultural development with emphasis upon economic, political and social implications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 306 History of American Technology (3)**

The development of industrial, transportation, and agricultural technologies in America. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 307 History of Science (3)**

A survey of the historical impact of science on human and physical environments from ancient to modern times. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 308 American Warfare (3)**

Inception, induction and impact of American warfare from 1775 to the present within the context of changing ideas and major political, social and economic developments. 3 lectures. Prerequisite: Junior standing.

**HIST 311 Early Britain (3)**

History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures.

**HIST 312 Early Modern Britain (3)**

History of the British Isles from the end of the Medieval epoch to the era of the American revolution—from Richard III to George III. 3 lectures.

**HIST 313 Modern Britain: Industry, Empire and War (3)**

History of the British Isles from the loss of the American colonies through the era of the World Wars and the dissolution of the British Empire. 3 lectures.

**HIST 314 The Middle East (3)**

Islamic civilization, the Ottoman Empire, origins of Pan-Islamism, Arab, Turkish, Iranian nationalism, impact of World Wars I and II, and the background of contemporary problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 315 Modern World History (3)**

GEB D.2.

Analysis of the interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant forces. Within this context, evaluate both the nature of industrial imperialism and the way in which it influenced or interfered with the host culture. 3 lectures.

**HIST 321 Chicano History (3)**

History of the struggle of the Chicano community within the United States for recognition and preservation of its culture and for economic and social equity. 3 lectures.

**HIST 325 Comparative History of American Minorities (3)**

Analyzes the political, economic and social status of various racial and ethnic groups in the United States, focusing on the history of Asians, Blacks, Chicanos and Native Americans, emphasizing both the general and particular forces that influenced their experience in America and the varying degrees to which each was able to maintain its cultural identity. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## 412 HIST

### HIST 328 American Indian History (3)

Historical examination of Native American culture; topics of conflict and contributions emphasized. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 329 American Indian Thought (3)

Cultural, spiritual, and philosophical concepts of several Native American societies; the intellectual and religious influences of Indians upon American society; their adaptation to White domination. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 331 Afro-American History (3)

Political and social history of Afro-Americans from the early 17th century to the present; emphasizes the Afro-American contribution to American cultural and political life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 339 Latin American History (3)

Political, social, economic and cultural history of Latin America. Class Schedule will list topics selected.

### HIST 341 Mexican History (3)

Obtrusion of Spanish institutions on the Mexican civilizations and the subordination of Spanish influence to the dominant Mexican cultures. Diffusion and struggle for identity of the Mexicans in North America, progress of their twentieth-century revolt for social equity. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 343 Greece and Rome (3)

The foundations of western civilization; origins and development of the science, technology, philosophy, religion, art, and sociopolitical institutions which produced the modern world; continuity between ancient times and the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 346 Medieval Europe (3)

Medieval society from the emergence of feudalism to the beginning of the Renaissance: triumph of the papacy; development of feudal monarchies and institutions; the crusades; recovery of commerce; rediscovery of Greek thought, and rise of universities. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 347 Renaissance and Reformation (3)

Decline of medieval universalism; rise of commercial capitalism and dynastic nation-states; flowering of the Renaissance; Protestant reformation. Economic, political, social, intellectual, and cultural influences. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 348 Religious Wars and Absolutism (3)

The era of the Counter-Reformation and Divine Right absolutism, religious and dynastic wars and their impact on the political, economic, social, religious and cultural fabric of European civilization. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 351 Europe in the Age of Reaction and Revolution, 1815-1871 (3)**

Reaction to the French Revolution; industrialization, the liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures.

**HIST 352 Europe in the Age of Imperialism and War, 1871-1919 (3)**

Maturation of industrialization, socialism and nationalism; the imperialist competition of nation states for world hegemony and the explosion of the First World War. 3 lectures.

**HIST 353 Europe in the Age of Fascism (3)**

Democracy in crisis and the fascist alternatives. The Second World War and the recovery of Europe in a bipolar world. 3 lectures.

**HIST 375 Urban History of America (3)**

Growth and development of American cities from the Colonial period through the 1970s. Includes a comparative analysis of American urban areas with city development in Europe, Asia and Africa. Special emphasis on the evolution of urban culture, assimilation of European ethnic groups, clash of city and rural values, rise of racial ghettos. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 381, 382 African History (3) (3)**

Survey of African history from earliest times; ancient African civilizations, Moslem penetration, indigenous kingdoms, European colonialism, rise of African nationalism, development of independent Africa as illustrated by the history of selected countries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 383 History of American Thought (3)**

Thought and culture in America since the Puritans. 3 lectures.

**HIST 384 Labor and Work in American History (3)**

Labor and work from the colonial period to the present. Analysis of the organization and division of the labor process, formation of classes, rise of unions and the shift from an industrial to a service and high technology workforce. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 385 Topics in California History (3)**

In-depth analysis of selected political, economic, and social issues involved in the development of California from the earliest times to the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 386 Frontiers in American History (3)**

Development and evolution of the frontier experience in successive chronological and geographic context. Consideration given to the various political, economic, social, cultural and religious factors which helped to bring about the end of the so-called frontier. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 387 From Colony to Empire: A History of U.S. Foreign Relations (3)**

Analysis of the evolution of this culture from an insecure appendage of European colonialism to a global power implementing a foreign policy based on hegemonic assumptions. Analysis of the impact of internal developments on foreign relations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**HIST 401 Colonial America (3)**

Age of exploration; European powers in eastern North America; English settlements; development of the English colonies, with emphasis on Virginia and Massachusetts; proprietary interests; growth of internal control, and colonial conflicts. 3 lectures. Prerequisite: Junior standing or consent of instructor.

## 414 HIST

### HIST 402 American Revolution (3)

Background of the Anglo-American imperial problem; the War for Independence and internal democratic upheaval of the era; establishment of the new nation, origins of the Constitution, the party system, American foreign policy, the national economy. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 403 Jacksonian America (3)

Growing nationalism and simultaneous development of sectional rivalries; emerging two-party system; the transportation revolution; early industrialization; and a changing social order. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 404 Civil War and Reconstruction (3)

Interaction of political, social and economic forces with personalities and ideas in a period in which the political process failed to function. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 405 Rise of Industrial America (3)

Interaction between rising industrialism and traditional agrarian democracy. Relationship between the industrial system and the values of democratic institutions. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 406 Progressive Era (3)

Economic, social, intellectual, and political history, and foreign policy. Progressive response to problems of industrialization, agriculture, and urbanization; development of the American corporate business system; era of normalcy and onset of the depression. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 407 Modern America (3)

Major developments of the mid-twentieth century. Change and growth in domestic and foreign policies; the Depression, New Deal, World War II, Cold War. Problems of world leadership and contemporary domestic problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 415 East Asian Civilization (3)

A survey of the central ideas and institutions which have shaped Chinese, Japanese and Korean civilization since ancient times. Emphasis on cultural themes rather than a political continuum. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 416 Modern Japan (3)

Japan's development as a modern state in the 19th and 20th centuries. Emphasized themes include the conflict of modernity and cultural continuity, the persistence of traditional values and postwar reconstruction of Japanese society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 417 Modern China (3)

Analysis of Chinese history in the twentieth century, the conflict between modernity and cultural continuity. The Chinese Communist Party and People's Republic of China since 1949. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 423 History in the Elementary School (3)

Selected history topics taught in grades 4-6 in California, including ethnic Americans, third world cultures and the interdisciplinary historical method. 3 lectures. Prerequisite: Junior standing or consent of instructor.

### HIST 424 Organizing and Teaching History (3)

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

**HIST 426 Tsarist Russia (3)**

Evolution of Russian autocratic society from the foundation of tsarist absolutism in the fifteenth century to 1917; reaction, reform and revolutionism. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 427 Soviet Russia (3)**

Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the revolution of 1917; the formative force of Marxism-Leninism, forced collectivization and industrialization, the social engineering of the New Soviet Man; World War II, the Cold War and peaceful coexistence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 429 History of Communism (3)**

Theory and practice of Marxian Communism since 1848. 3 lectures. Prerequisite: HIST 205 and junior standing or consent of instructor.

**HIST 435 Women in History (3)**

Traditional roles and attitudes about women; contributions of individual women; changing conditions and their implications for today's woman. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 437 Nazi Germany (3)**

Intellectual, social and cultural roots of National Socialist ideology and how they combined under the influence of Adolph Hitler to produce the Nazi Revolution. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 460 Senior Project (2)**

Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 60 hours time. Prerequisite: HIST 301.

**HIST 463 Undergraduate Seminar (2)**

Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 301.

**HIST 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 590 Seminar in History (3)**

Historical analysis of selected problems and topics. Each seminar will carry a subtitle descriptive of its content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

**HUM—HUMANITIES****HUM 302 Human Values in Agriculture (3)**

Nature of values at issue in agriculture which impact on the wider community. Technical-factual foundation of needs of agriculture which contribute to value conflicts, discrimination between resolvable and unresolvable conflicts, ethical principles and devices yielding resolutions. Interdisciplinary team taught, with guest lecturers and possible field trips. Literary materials, novels, short stories, and expository history giving dramatic expression to values. 3 lectures.

**HUM 320 Future Studies (3)****GEB C.3.**

Evaluation of methods used in forecasting future trends. Critical examination of the projections made by futurists and their implications for humanity. 3 lectures. Prerequisite: One composition course or consent of instructor.

**HUM 350 Aesthetics (3)****GEB C.3.**

Cultivation of an intellectual and experiential basis for aesthetic values and judgment of artistic phenomena which includes the disciplines of philosophy, religion, history, fine arts, psychology and literature. 3 lectures. Prerequisite: English composition course or consent of instructor.

**HUM 400 Independent Study Project (1-2)**

Independent study project focusing more than one discipline on a problem in the Humanities. May involve travel and/or independent research. Bibliography and study plan submitted in advance. 1-2 activities. Prerequisite: Junior or senior standing and consent of instructor.

**HUM 402 Values and Technology (3)****GEB C.3.**

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Nontechnical. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: Junior or senior standing.

**HUM 470 Selected Advanced Topics (2-4)**

Focused interdisciplinary study of a problem in the Humanities combining the insight and expertise of more than one discipline, such as history, literature, religious studies, philosophy, fine arts and the sciences. 2-4 lectures. Prerequisite: Consent of instructor.

**IE—INDUSTRIAL ENGINEERING****IE 101 Introduction to Industrial Engineering (3)**

Historical development of the industrial economy and the profession of industrial engineering. Basic concepts and principles of industrial organization and management. The dynamics of industrial engineering in the field of systems, production, and data processing. Review of career opportunities. 3 lectures.

**IE 123 Industrial Systems Analysis (4)**

Systems, subsystems, and relationships (interfaces) of industrial systems concepts in modern productive society. Trends in techniques for data gathering, analysis, and presentation for management decisions. 3 lectures, 1 laboratory.

**IE 141 Manufacturing Processes (1)**

Metal casting as a process in manufacturing. Properties of molding materials and methods of casting. Sand, shell molding, investment molding and casting, core making, and sand testing. Pattern and casting design principles. 1 laboratory.

**IE 142 Manufacturing Processes II (2)**

Laboratory work similar to IE 141. Expanded theory, principles, advantages, and limitations of casting process. 1 lecture, 1 laboratory.

**IE 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**IE 201 Production Costs Estimating (3)**

Estimating the costs of manufactured products and services on detailed estimates of labor, materials, overhead and general and administrative type expenses. Topics include break even points, price breaks, industrial learning, network cost analysis, multiple regression derived formulas, labor efficiency and cost indices. 3 lectures. Prerequisite: Sophomore standing.

**IE 214 Production Control (2)**

Coordination of production facilities to meet objectives of customer service, minimum inventory investment, and maximum manufacturing efficiency. Forecasting, statistical determination of order requirements, group technology concepts, input-scheduling and machine loading control techniques. Production systems computer modeling. 2 lectures. Prerequisite: Sophomore standing.



**IE 222 Engineering Analysis (3)**

Methods of evaluating variability of engineering design parameters, predicting deviations from expected averages, counting, grouping data for computations. Computation techniques. Expected fit within engineering tolerances and allowable signal fluctuations. 2 lectures, 1 activity. Prerequisite: MATH 131.

**IE 223 Man-Machine Systems (4)**

Principles of work simplification, methods flow charting and micro-motion analysis. Quantitative analysis of work measurement methods including time study, synthetic data and work sampling. Review of allowances and performance ratings. Integration of these techniques in man-machine systems. 3 lectures. 1 laboratory. Prerequisite: MATH 141.

**IE 233 Computer Aided Manufacturing (2)**

Manual and computer programming systems for machining operations. Control tape verification by plotter techniques. NUMERIDEX teletype and microprocessor systems incorporated into control tape generating operations. IBM APTIV System utilized in computer program output control for manufacturing. 1 lecture, 1 laboratory. Prerequisite: ETME 142, ETMP 144, ENGR 251.

**IE 239 Industrial Costs and Controls (4)**

Estimating of manufacturing costs for production planning, cost analysis, and cost control. Budgeting and use of cost and accounting data and analysis of cost variances for managerial control, inventory valuation, and pricing decisions. Techniques of forecasting, cost estimating, and cost reduction. 3 lectures, 1 laboratory. Prerequisite: IE 223.

**IE 240 Additional Engineering Laboratory (1-2)**

Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

**IE 251 Manufacturing Engineering Laboratory (4)**

Properties of materials including relative cost selection for industrial use. Experimental studies in properties and behavior of metals, heat treatment, powder metallurgy, EDM, and metrology. Instrumented analysis of cutting tool forces and machine tool alignment with laser interferometry. 2 lectures, 2 laboratories. Prerequisite: CHEM 124, MATH 142.

**IE 303 Project Management (2)**

Design, analysis and implementation of a major industrial/business systems problem. Emphasis on periodic impacting situations requiring resolutions and management decisions by groups representing various elements of an industrial company structure. 2 lectures. Prerequisite: IE 123.

**IE 304 Operations Research (3)**

Introductory study of matrix theory, linear programming by graphical and Simplex method, sensitivity analysis, transportation and assignment algorithms. Introduction to goal planning. Existing computer programs and algorithms utilized. 3 lectures. Prerequisite: STAT 321, MATH 242.

**IE 312 Data Management and System Design (3)**

Design and management of industrial data bases and reporting systems. Topics include relationships to financial accounting and production control systems, efficient data entry routines, report formats, data base managers and system benefit cost analysis. 2 lectures, 1 laboratory. Prerequisite: ENGR 251.

**IE 314 Engineering Economics (3)**

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: ECON 201 or equivalent, junior standing.

**IE 316 Microprocessors as Control Devices (3)**

Microprocessor as control device. Its place in industry. Basic control theory. Microprocessor architecture. Microprocessor programming using machine language with an 8080 trainer unit. Solving several control problems including running a stepping motor. 3 lectures.

**IE 319 Human Factors Engineering I (3)**

Research into factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Human reactions and capabilities related to specific tasks and systems. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. 3 lectures. Prerequisite: PSY 202 and junior standing.

**IE 334 CAD/CAM (3)**

Identification and study of the individual techniques of CAD/CAM as being practiced in modern industry. 2 lectures, 1 laboratory. Prerequisite: IE 233, IE 251, and a course in a high level computer language.

**IE 343 Facilities Design (4)**

Utilization of manufacturing data in the design of production processes and planning industrial facilities. Quantitative analysis of integrated plant arrangement. Product flow, production line balancing, material handling, warehousing. Computerized methods and CADAM systems. Systems approach to optimum facilities design. 2 lectures, 2 laboratories. Prerequisite: IE 239, IE 251, IE 405.

**IE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units, with a maximum of 2 units per quarter.

**IE 401 Sales Engineering (2)**

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars. Prerequisite: Senior standing in engineering, or consent of instructor.

**IE 403 Principles of Engineering Economics (3)**

Development of methods to assess the time-value of money through mathematical models. Evaluating economic factors in the making of individual or industrial decisions. Effects of depreciation and income taxes on the analysis. 3 lectures. Prerequisite: Senior standing in other than engineering.

**IE 405 Operations Research II (3)**

Theory and applications of network analysis, queuing models, dynamic programming and inventory models, computer programming in solution of problems. 3 lectures. Prerequisite: IE 304.

**IE 407 Algorithmic Systems Analysis (3)**

Advanced linear programming as applied to problems in industrial systems. Integer programming using branch-and-bound. Nonlinear programming. Quadratic programming. Dynamic programming concepts. 3 lectures. Prerequisite: MATH 242, IE 405.

**IE 408 Production Systems Analysis (3)**

Forecasting, job scheduling and sequencing, stochastic inventory, and related methodology for operation, design, and control of productive systems. Case studies from current journals. 2 lectures, 1 laboratory. Prerequisite: IE 405.

**IE 409 Information Systems Optimization (3)**

Economic evaluation of information for sequential decision process; Bayes theory and models. Decision theory and value information applied to production control. Cybernetics, information theory introduced. 3 lectures. Prerequisite IE 408.

**IE 410 Systems Control Design (3)**

Planning and control systems required in manufacturing firms. Development of systems to assist in forecasting demand, scheduling orders, assigning workforce, controlling inventory and monitoring costs. Evaluate the control system performance using computer-based manufacturing simulators PROSIM and GALS. 2 lectures, 1 laboratory. Prerequisite: IE 239, ENGR 251, IE 405, or consent of instructor.

**IE 413 Flexible Manufacturing Systems (3)**

Application of modern techniques related to production scheduling decisions. Shop floor control with emphasis on priority scheduling. Group technology and existing classification and coding systems. Cellular manufacturing and production flow analysis. Flexible manufacturing systems. Material resource planning. Computer applications. 3 lectures. Prerequisite or concurrent: IE 405, ENGR 251.

**IE 420 Simulation for Design Analysis (3)**

Design and analysis of manufacturing and service systems by simulation. Basic concepts of simulation type models, functions of random variables by random number and function generators, basic programming concepts, characteristics of simulation languages. 2 lectures, 1 laboratory. Prerequisite: ENGR 251, IE 405.

**IE 421 Manufacturing Organization (3)**

Theory and principles of manufacturing organizations. History of industrial organization. Engineering management concepts and practice. Use of case discussion method. Planning and operations in terms of human and other resources and factors within and external to the firm. 3 seminars. Prerequisite: Senior standing, PSY 202.

**IE 424 Engineering Test Design and Analysis (3)**

Design and statistical analysis of engineering experiments. Linear and nonlinear regression and analysis of variance techniques used in model building; testing of hypotheses for manufacturing decisions. Experimental methods for evaluation and comparison; interpretation of interference, fatigue and field data. 3 lectures. Prerequisite: STAT 321.

**IE 425 Reliability Assurance (3)**

Reliability mathematical models, mechanical device reliability, electrical device reliability, reliability data, assurance program elements. 3 lectures. Prerequisite: MATH 242, STAT 321, IE 304.

**IE 430 Statistical Quality Control (3)**

Statistical theory of sampling for managerial control of quality of services or processes, by variables or by general attributes. Decisions based on sampling using operating characteristics and control charts to delineate risks. Experiments with problem solving in labs. 2 lectures, 1 laboratory. Prerequisite: STAT 321.

**IE 437 Human Factors Engineering II (4)**

Principles, concepts and models used in maximizing human performance capabilities at the workplace. Experimental methods for generating rational data relative to man-machine interface. Data and multi-variate analysis. 3 lectures, 1 laboratory. Prerequisite: IE 319 and STAT 321 or equivalent.

**IE 441, 442 Fundamentals of Supervision (2) (1)**

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in manufacturing laboratories; 2 laboratories; 1 laboratory. Prerequisite: IE 141, IE 233 and senior standing in major.

**IE 461, 462 Senior Project (2) (3)**

Faculty supervised projects typical of problems which graduates encounter in their profession and which involve costs, planning, scheduling and research. Formal written report, suitable for reference library, discussing methods, results and conclusions. Minimum 150 hours total time. Prerequisite: IE 334, IE 343 and IE 314 and consent of department.

**IE 463 Undergraduate Seminar (2)**

Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments and/or subject matter pertinent to industrial engineering. 2 seminars. Prerequisite: IE 462 concurrent or consent of instructor.

**IE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**IE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**IE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**IE 541 Advanced Operations Research (3)**

Models for mathematical programming and operations research. Mathematical programming topics in linear programming, network analysis, and dynamic programming. Operations research models will include queuing, inventory models, simulation, and Monte Carlo. Special analysis problems in nonlinear programming and integer programming. 3 seminars. Prerequisite: IE 304, IE 424, graduate standing or consent of instructor.

**IE 542 Reliability Engineering (3)**

Theory and techniques for determining the reliability of systems and system elements. Influence of failures in series, parallel, and redundant designs. Failure modes and effects. Frequency distributions of failures and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and effectiveness. 3 seminars. Prerequisite: IE 424, IE 425, IE 430, graduate standing or consent of instructor.

**IE 543 Advanced Human Factors (4)**

Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 3 seminars, 1 laboratory. Prerequisite: IE 319 or equivalent, graduate standing or consent of instructor.

**IE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned an industrial project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. An appropriate experimental or analytical thesis may be accepted.

## IT—INDUSTRIAL TECHNOLOGY

**IT 101 Technical Problem Solving (3)**

Intensive investigation of the three major steps in technical problem solving. Defining the problem; planning and implementing the process for determining the solution; effective communication of the solution. Modern information processing systems. 3 lectures.

**IT 125 Industrial Wood Processes (3)****GEB F.2.**

Theory and practice relating to basic woodworking processes, materials and equipment used in cabinetmaking and furniture industries. Practical applications include the construction of a project. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities.

## IT 130 Automotive Fundamentals (2)

GEB F.2.

Principles of operation and familiarity with basic components of the automobile from the consumer viewpoint. Economics of selection, operation, and preventive maintenance. Practical experience, owner inspection, maintenance and repair for beginners. Understanding of pollution control systems. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 laboratory.

## IT 141 Plastics Processes and Applications (1)

GEB F.2.

Uses, capabilities, and operational characteristics of plastics machinery and process fabrication equipment. Properties and classes of molds, tools. Plastics processes and applications. Introduction to injection molding, extrusion, compression molding, rotational molding, foaming, casting, and plastic fabrication techniques. Miscellaneous course fee required—see Class Schedule. 1 laboratory.

## IT 222 Energy and Power (4)

Introduction to energy sources, energy conversion and power, includes fossil, atomic and solar resources, conversion by current power technology including reactors, internal, external combustion and direct conversion. Power transmission systems and system maintenance including electrical, mechanical, pneumatic and hydraulic systems. Automobile used as one exemplary system. 4 lectures.

## IT 229 Industrial Materials (3)

Investigation of the characteristics, applications and limitations of materials of industry including: organics, ceramics and metallics. 2 lectures, 1 activity.

## IT 233 Metal Technology (3)

GEB F.2.

Theory and practice in care and use of hand and machine tools. Applications of welding, forging, foundry, sheet metal, ornamental metal, electroplating and bench metal processes to the fabrication of metal products. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities.

## IT 235 Industrial Drawing (2)

Methods, policies and practices used in preparing, reading and applying industrial and construction drawings, their techniques and language to the industrial and construction projects, presentations and proposals common to the management and construction industries. 1 lecture, 1 laboratory. Prerequisite: ETME 131 or high school drafting.

## IT 237, 238 Industrial Electricity (3) (3)

Theory and application of basic a.c. and d.c. circuits as they pertain to industry and teaching applications. Magnetic circuits. Principles of motors and generators, instruments, control and control circuits, transformers and circuitry, oscilloscopes. 2 lectures, 1 laboratory.

## IT 245 Technical Sketching (2)

Freehand sketching of industrial products using perspective, isometric oblique and orthographic projection. Shading. Basic design. 2 activities.

## IT 250 Transportation Power (4)

Introduction to world transportation and transportation power: land, sea, air and space transport systems, regulation, operational theory; piston, rotary and turbine engines; ignition, fuel, charging, cooling and lubrication systems. Miscellaneous course fee required—see Class Schedule. 3 lectures, 1 laboratory.

## IT 304 Product Quality Control (3)

Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audit. 3 lectures.

## IT 305 Technical Presentations (3)

Preparation of students for addressing groups of people on technical topics using available audiovisual media. 1 lecture, 2 activities. Prerequisite: Junior standing, IT 235, IT 245, SPC 201 or SPC 202.

**IT 311 Plant Safety Fundamentals (3)**

Fundamentals of safety management, background liabilities and safety legislation, hazards and their control in industry and industrial education: falls, falling objects, impacts, mechanical injuries, pressure, electrical, fires, explosions, toxic materials, radiation, vibration, noise. 2 lectures, 1 activity. Prerequisite: Junior standing.

**IT 315 Alternate Energy Technology (3)**

Investigating the theory, cost and construction of alternate energy supply and use systems. Solar (passive and active) hot water and house heating. Wind system components including rotor, generator, relays, site selection. Alcohol production and use as a fuel. 2 lectures, 1 activity.

**IT 324 Modern Industrial Finishes (2)**

Study of the characteristics and applications of modern industrial finishes to products of industry. Practical experiences in the application of select modern industrial finishes and refinishing. Miscellaneous course fee required—see Class Schedule. 2 activities.

**IT 326 Product Development and Evaluation (3)**

Practical application of value analysis and production quality control techniques as applied to industrial products; methods of product development and the interaction between marketing and production functions and design engineering. 2 lectures, 1 activity. Prerequisite: IT 101.

**IT 327 Plastics Technology (3)**

Materials, processes and applications of industrial polymers. Basic operations in processing, fabricating and finishing of thermal plastic and thermal setting resins, product and materials testing. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: IT 125, CHEM 122

**IT 330 Fundamentals of Industrial Packaging (3)**

Overview of packaging: historical development, functions, and materials, processes and technology employed to protect goods during manufacture, handling, shipment and storage. Container types, package design, development, research and testing. Economic importance and perspective as an industrial activity. 3 lectures. Prerequisite: Junior standing.

**IT 331 Advanced Industrial Electrical Systems (4)**

Industrial applications of electrical power distribution systems, industrial wiring, illumination, motors and controllers. Field trips. 3 lectures, 1 activity. Prerequisite: IT 238, MATH 131

**IT 332 Electronic Control Systems (4)**

Automated control devices from an operational and servicing viewpoint. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: PHYS 122, IT 237

**IT 333 Electronic Computer Applications (4)**

Fundamentals of analog and digital computers and numerical control machines, number systems, logical and sequential circuits and devices, basic and A.P.T. languages, computer aided design and manufacturing. Word processing, simulation, documentation, personal computers and process control. 3 lectures, 1 laboratory. Prerequisite: IT 101, or consent of instructor.

**IT 334 Materials Handling and Packaging (3)**

Technical interrelationships between materials handling and industrial packaging: design, materials, quality control, packaging and product manufacturing, storage, transportation and marketing. 2 lectures, 1 activity. Prerequisite: IT 330 or GRC 330.

**IT 337 Advanced Plastics Processes (3)**

Advanced plastics processing techniques and principles, operation of thermoplastic and thermosetting polymer processing and testing equipment. Plastics processing behavior. Plastics machinery instrumentation, control and evaluation. Polymer flow and deformation evaluation. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 327.

**IT 340 Automotive Technology, Engines (3)**

Engine overhaul and maintenance, theory and construction. Practical activities with various types of engines, including automotive, marine, motorcycle, and low horsepower power plants. 1 lecture, 2 laboratories. Prerequisite: IT 250.

**IT 342 Automotive Technology, Engine Heads (3)**

Theory and operation of automotive cylinder heads, valve train for both spark ignition and diesel engines. Maintenance including testing, machine processes, rebuilding procedures and adjustments. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 250.

**IT 344 Automotive Technology, Chassis (3)**

Fundamental, technical, and teaching aspects of automotive suspension systems, steering, braking, and other control systems. Tires and lubrication. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 250.

**IT 350 Quality Systems Applications (3)**

Philosophy and principles of quality system administration. Relationship to total systems program administration; impact on management information and data requirements. Quality system administration techniques applied to control performance, cost and schedule data, traceability, and retrievability. 3 lectures. Prerequisite: MATH 120, junior standing.

**IT 352 Additional Laboratory Problems (1-2)**

Advanced instruction in design, materials, construction and repair in the various industrial arts areas. Total credit limited to 4 units with not more than 2 units in any one quarter. Miscellaneous course fee required—see Class Schedule. 1 or 2 laboratories. Prerequisite: Consent of instructor.

**IT 353 Furniture Design and Construction (3)**

Theory and practice in the application of design principles, materials and construction techniques as related to the manufacture of fine furniture. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: IT 125.

**IT 354 Woodworking Machine Tool Maintenance (3)**

Theory and practice in the maintenance and repair of hand tools, portable power tools and major power machinery related to the area of woodworking. 1 lecture, 2 activities. Prerequisite: IT 125.

**IT 355 Cabinetmaking (3)**

Examination of modern materials and construction techniques as related to cabinetmaking. Field work in comprehensive projects stressing decision making and design solutions to the problems of cabinetmaking. Team projects with emphasis on job organization, scheduling and construction. 1 lecture, 2 activities. Prerequisite: IT 125.

**IT 356 Building Construction (3)**

Examination of modern materials and methods of construction as related to residential construction. Team field work on actual construction projects, including decision making and design solutions, job organization, scheduling, bidding procedures and building codes. 1 lecture, 2 laboratories. Prerequisite: IT 125.

**IT 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**IT 404 Customer Relations (3)**

Customer contacts; personal relationships, ethics, legal relationships, service contracts, communication channels. 3 lectures. Prerequisite: MKTG 301, senior standing or consent of instructor.

**IT 405 Industrial Marketing (3)**

Investigation of the institutions and channels involved in industrial marketing. Analysis of industrial products, competitors, and consumers. Problems in marketing research, personnel, and management. Individual reports on industrial products, companies or training programs. 3 lectures. Prerequisite: MKTG 301.

**IT 406 Industrial Cost Control (3)**

Application of cost control techniques and processes for the industrial manager; techniques and procedures of cost reduction. Investigate methods of reducing waste and inefficiency in business and industry considering labor processes, products, materials and systems. 3 lectures. Prerequisite: Senior standing or consent of instructor.

**IT 407 Industrial Product Development (3)**

Organization for new industrial product development, linking marketing, operations and technology functions; sources and screening of new product ideas, sizing and evaluation of market prospects, budgeting, pricing, timing, advertising and distribution factors as they relate to new industrial products, internal coordination during product development phases. 3 lectures. Prerequisite: IT 404, IT 405 or consent of instructor.

**IT 408 Protective Packaging (3)**

Principles of protective packaging development. Packaging of different classes of products. Materials and test methods for cushioning, blocking, barriers, packing. Development of cushion design, problem solving. Analysis of package configurations, closing features, locking devices and labels. Examination of permeability of materials to gases, vapors and liquids, considerations of biological protection of packages and packaging materials. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121, CHEM 121, MATH 131, or equivalent.

**IT 409 Machinery For Packaging (3)**

Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Required field trips to packaging operations. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121 or equivalent.

**IT 410 Drafting: Industrial Education (2)**

Teaching applications of drafting principles, home planning, sketching, rendering and industrial working drawings. For high school industrial arts drafting teachers. Field trips to industrial drafting offices. 2 activities. Prerequisite: IT 235 or consent of instructor.

**IT 412 Industrial Illustration (3)**

Fundamental theories and techniques involved in the preparation of industrial technical illustrations and industrial drawings and photographs for duplication processes and presentation purposes. Experiences in delineation, use of pastels, brush and air brush. Miscellaneous course fee required—see Class Schedule. 3 activities. Prerequisite: IT 245 or consent of instructor.

**IT 413 Plant Maintenance Management (3)**

Maintenance function. Maintenance repair, and operations of industrial plant facilities including utility and mechanical systems, preventive maintenance, job control systems, work estimating, budgeting, other essential services. 3 lectures. Prerequisite: IT 415.

**IT 414 Industrial Energy Conservation (3)**

Energy management, auditing, costing in industrial facilities. Power factor, lighting, process recycling, heating cooling losses, solar energy. 3 lectures. Prerequisite: ACTG 222, IT 331 or consent of instructor.

**IT 415 Industrial Equipment and Systems (3)**

Major mechanical equipment and systems making up the utility and production support systems of a modern industrial facility. 3 lectures. Prerequisite: IT 431.



**IT 416 Industrial Power and Lighting (3)**

Major power systems in a modern industrial plant, including electrical distribution systems and industrial and commercial illumination. Planning and budgeting of industrial power and lighting systems. 3 lectures. Prerequisite: IT 331.

**IT 417 Plant Facilities Management (3)**

Management of the modern industrial facility, including capital and operating budgeting, forecasting, organization. 3 lectures. Prerequisite: IT 413, IT 415, IT 416, ECON 212.

**IT 418 Technical Management Problems (4)**

Organization and positions of key personnel in corporate technical management structure; their functions, duties and interfaces with operations, marketing, general management and research/development. Structure and objectives, related specifications and proposals with case studies. 3 lectures, 1 activity. Prerequisite: Senior standing, MGT 311, or consent of instructor.

**IT 419 Industrial Internship (2-6) (CR/NC)**

Part-time industrial experience, with or without pay. Conducted under company and faculty supervision. Guided observations related to technical management. Report of experiences required at end of quarter. Credit/No Credit grading.

**IT 424 Curriculum and Methods of Industrial Education (3)**

Industrial education curriculum and instructional processes. Organization, selection, presentation, application, interpretation and evaluation for teaching automotives, drafting, electronics, graphic arts, metals, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity.

**IT 425 Automotive Technology, Fuel Systems (3)**

Fuel systems and fuels used in internal combustion engines. Carburetor, fuel injection, turbo-chargers, manifolds, pumps, and storage tanks. Emission control systems. Types of fuels and their compounding. 2 lectures, 1 laboratory. Prerequisite: IT 250.

**IT 427 Automotive Technology, Electricity and Electronics (3)**

Applications of electronics and electrical systems in automotive type equipment including ignition, lighting, starting, charging, auxiliary systems, and control systems. 2 lectures, 1 laboratory. Prerequisite: IT 250.

**IT 429 Automotive Technology: Tune-up (3)**

Theory and service of automotive systems related to engine performance. Function and use of service equipment, manufacturers specifications and automotive components relating to starting, charging, ignition, fuel, emission control and exhaust systems. 1 lecture, 2 activities. Prerequisite: IT 250 or consent of instructor.

**IT 431, 432 Mechanical Systems (4) (4)**

Application of laws of physics and thermodynamics to various systems. Engines, pumps, heat exchange, piping, hydraulics, pneumatics, refrigeration, air conditioning, nuclear energy. 3 lectures, 1 activity. Prerequisite: MATH 131, PHYS 122, IT 222.

**IT 433 Production and Process Management (3)**

Production equipment and systems, metals, measurement, tooling and finishes. Mass production. Production management. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 activity. Prerequisite: IT 229.

**IT 435 Package Development Management (3)**

Managing the development of industrial and consumer goods packaging from concept to market place. Interplay of marketing, economic, technical, production and distribution considerations in developing a package. Organizing the package function for best results. Case studies of package/product successes and failures. Class project for analysis and solution. 3 lectures. Prerequisite: IT 330 or GRC 330, IT 408, IT 409.

**IT 437 Reinforced Plastics (3)**

Mold preparation and production of reinforced plastic products. Standard specifications for reinforced materials and resin systems. 1 lecture, 2 laboratories. Prerequisite: IT 327 or consent of instructor.

**IT 438 Plastics Mold Construction (3)**

Properties and characteristics of thermosetting and thermoplastic materials. Analysis and construction of molds and dies for use with reinforced plastics, injection molding, thermoforming processes; extrusion, and compressions and transfer molding and polymer castings. Selection of plastics. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories. Prerequisite: IT 327.

**IT 441 Metal Production Processes (3)**

Mass-production techniques; design, production planning, tolerances, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial production products. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 233 or IT 433 or IT 443.

**IT 443 General Metals (3)**

Theory and application of various metal processes. Problem solving in joining, casting, machining and forming as applied in industrial education and industrial fabrication. Maintenance of metalworking equipment. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 activities. Prerequisite: IT 233.

**IT 444 Technical Drawing: Industrial Education (3)**

Application of current drafting procedures in preparing complete graphic descriptions of industrial components. Sketching, lettering, instrument drawing. Preparation of work drawings and specifications. Analysis of drafting materials, equipment and processes. 1 lecture, 2 activities. Prerequisite: IT 245, ETME 142, or consent of instructor.

**IT 446 Wood Production Processes (2)**

Mass-production techniques as related to woodworking. Design and construction of jigs and fixtures to facilitate assembly line production of selected projects. 2 activities. Prerequisite: IT 125.

**IT 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their field of employment. Project results are presented in a formal report and must be completed during two consecutive quarters. Minimum 120 hours total time. Prerequisite: Senior standing.

**IT 463 Industrial Technology Seminar (4)**

Functions, philosophies and current trends of industry. Content will be presented using such methods as lectures, guest lecturers, panel discussions and debates. 2 seminars, 2 activities. Prerequisite: Senior standing.

**IT 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**IT 471 Selected Advanced Activity (1-3)**

Directed group study for advanced undergraduate and graduate students. Class schedule will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of instructor.

**IT 500 Individual Study (1-6)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head or graduate adviser and supervising faculty member.

**IT 515 History and Philosophy of Industrial Education (3)**

Development of industrial education from its initial conception to the present time. Current philosophical concepts of the field. 3 seminars. Prerequisite: Graduate standing.

**IT 520 Organization and Administration of Industrial Education (3)**

Case studies of current problems in the administration and organization of industrial arts and industrial-technical education. Problems in industry, financing industrial education, work-experience and adult education programs, and community education. 3 seminars. Prerequisite: Graduate standing.

**IT 521 Curriculum in Industrial Education (3)**

Basic principles and practices in the preparation of course guides, courses of instruction and related materials for industrial instruction. 3 seminars. Prerequisite: Graduate standing.

**IT 522 Facility Planning in Industrial Education (3)**

Analysis of major factors in planning and designing industrial education laboratories and related areas. Includes State standards, equipment specifications, and presentation displays. 3 seminars. Prerequisite: Graduate standing.

**IT 527 Trends and Issues in Industrial Education (3)**

Guided study and discussions of current and innovative practices in industrial education. Identification of major issues facing the industrial educator. Development of a personal philosophy of industrial education. 3 seminars. Prerequisite: Graduate standing.

**IT 580 Graduate Research in Industrial Education (3)**

Advanced study and analysis of selected topics and problems in industrial education. 3 seminars. Prerequisite: Graduate standing.

**IT 599 Industrial Education Thesis or Project (5)**

Each student will propose, develop and complete a thesis or project involving individual research that is significant to the field of industrial education. Prerequisite: Acceptable academic standing in the master's degree program in Industrial and Technical Education and consent of instructor.

**JOUR—JOURNALISM****JOUR 118 Mass Media in Society (3)**

Examination of the mass media, their methods, purposes, and functions. Responsibilities of journalists; importance of media in society, 3 lectures.

**JOUR 201 Journalism History (3)**

Survey of historical influences in the development of today's journalism. 3 lectures.

**JOUR 203 Reporting I (3)**

Techniques of news reporting and writing. Intensive practice in gathering and evaluating information and writing basic news stories. 2 lectures, 1 two-hour laboratory. Prerequisite: ENGL 114, and typing proficiency.

**JOUR 205 Agricultural Communications (3)**

Survey of the media of agricultural communication: newspaper farm pages and sections, general and specialized agricultural magazines, farm broadcasts on radio and TV; public and private agencies involved in agricultural communication. 3 lectures.

**JOUR 233 Copy Editing (3)**

Copy desk work: rewriting, editing, and headlining news copy. Selecting, cropping, and captioning news photos. 1 lecture, 2 two-hour laboratories. Prerequisite: JOUR 203.

**JOUR 302 Law for Journalists (3)**

State and federal laws affecting journalists. Hazards of libel and what defenses are recognized; contempt of court, right of privacy; study of postal regulations, regulations in advertising, broadcasting, photography, and business regulatory statutes; ethics and responsibility of the press and broadcast media. 3 lectures.

**JOUR 304 Reporting II (3)**

Advanced news reporting and writing. Extensive practice on campus in interviewing, beat reporting, covering speeches and meetings and use of library and other information resources. 2 lectures, 1 two-hour laboratory. Prerequisite: JOUR 203.

**JOUR 312 Introduction to Public Relations (3)**

Principles of public relations and public opinion; methods employed in dissemination of public information by various organizations. 3 lectures.

**JOUR 323 Photojournalism (3)**

Application of photographic techniques to journalism. Use of lighting, particularly electronic flash. Use of 35mm camera and other cameras in journalism. Introduction to the principles of news photography for television. Application of darkroom techniques suitable for news media deadline requirements. Assignments using still cameras and black and white film. Integration of photographic and writing skills. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, ART 221.

**JOUR 326 Broadcast Announcing (3)**

Radio and television announcing of news, sports, special events, commentary, features, commercials, and talk and discussion. 1 lecture, 2 activities. Prerequisite: SPC 201 or SPC 202.

**JOUR 331 Advertising (3)**

Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. 3 lectures.

**JOUR 333 Broadcast News I (3)**

Radio news course with emphasis on live and taped interviews, newscast production and presentation, reporting, and broadcast newswriting style. 2 lectures, 1 two-hour laboratory. Prerequisite: JOUR 203.

**JOUR 342 Public Relations Media (3)**

Writing and editing for magazines, smaller format publications and visual presentation. 3 lectures. Prerequisite: JOUR 203 and JOUR 312 or consent of instructor.

**JOUR 351 Journalism Practice (2)**

Credit arranged by sections as indicated by subtitle for students holding editorial or photographic positions on such departmental publications as *Mustang Daily*, or radio station KCPR, Poly PR or other similar supervised experience. 2 laboratories. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**JOUR 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**JOUR 401 International Press (3)**

Global communications facilities and operations; world transmission of information; survey of world wire services and international print and broadcast news media. Analysis of press operations under varying government ideologies. 3 seminars. Prerequisite: Junior standing.

**JOUR 405 Reporting III (3)**

Specialized, investigative and interpretative reporting and writing. Frequent off-campus assignments, with a focus on law enforcement, courts and governmental affairs. 2 lectures, 1 two-hour activity. Prerequisite: JOUR 304 and typing proficiency.

**JOUR 407 Magazine Writing (3)**

Feature writing techniques. Markets for nonfiction articles; practice in research and preparation of articles. 3 lectures. Prerequisite: JOUR 203 or consent of instructor.

**JOUR 413 Advanced Public Relations (3)**

Methods employed in dissemination of public information by organizations. Survey of media, case histories, formation and measurement of public opinion. 3 lectures. Prerequisite: JOUR 203, JOUR 312, JOUR 351 or consent of instructor.

**JOUR 425 Advertising Layout and Copywriting (2)**

Advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 two-hour laboratory. Prerequisite: JOUR 331 or consent of instructor.

**JOUR 432 Broadcast News II (3)**

Video tape and filmed television news interviews, reports, and features. Television continuity and newswriting. Production of television public affairs broadcasts. 2 lectures, 1 laboratory. Prerequisite: JOUR 333, ART 221 or consent of instructor.

**JOUR 434 Advanced Editing (3)**

Daily experience and responsibilities in editing and rewriting news and feature stories. Practical application of headline writing and page makeup principles. 1 lecture, 2 two-hour laboratories. Prerequisite: JOUR 233, JOUR 304.

**JOUR 444 Media Internship (4)**

Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism.

**JOUR 460 Senior Project (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

**JOUR 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## LA—LANDSCAPE ARCHITECTURE

**LA 110 Graphic Communication for Landscape Architects (3)**

Communication through descriptive drawing and professional plan graphics, including theories of perspective. 3 laboratories.

**LA 152 Orientation to Design and Planning in Landscape Architecture (4)**

Exploration of design and planning projects on different scales and in different environmental settings: site, community, city, region. Contextual understanding of landscape architecture and other environmental design disciplines. Identification of natural and cultural elements in the environment. 4 laboratories.

**LA 201 Introduction to Landscape Architecture (2)**

GEB F.2.

Survey of the profession of landscape architecture from small space design to regional planning. Relationships between landscape architects and society and professionals in related fields. 2 lectures.

**LA 203 Applied Design and Planning Fundamentals (3) (Also listed as CRP 203)**

Focus on the application of basic design fundamentals and design of environments through a series of design exercises. 3 laboratories. Prerequisite: EDES 202, LA 213, with LA 152 for LA majors only.

**LA 213 Site and Terrain Analysis (3-4)****GEB F.2.**

Introduction and application of selected inventory and analysis techniques through interpretation, reading and evaluation of land and terrain descriptions including maps, air photos, soil survey, hydrologic studies, contour and landform models. Projects range in size and scope from limited sites to regional areas. 2 lectures, 1-2 laboratories.

**LA 231 Landscape Architecture Construction (3)**

Introduction to basic principles and methods of landscape architectural landform manipulation. 3 laboratories.

**LA 240 Additional Landscape Architecture Laboratory (1-2)**

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

**LA 310 Introduction to Computing in Planning and Design (2)**

Introduction to computing for planning and design students. Familiarization with micro and mainframe computer hardware currently being utilized by the profession and programming concepts germane to application programs used in the Department of Landscape Architecture. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and third year standing or consent of instructor.

**LA 311 History of Landscape Architecture (3)****GEB F.2.**

Historical evaluation of man's interaction with outdoor space. Analysis of influences that direct, perpetuate, and form the landscape. 3 lectures.

**LA 313 Architectural Design for Landscape Architects (3)**

Exposure to architectural design concepts and theories with attention given to historical and contemporary case studies. Discussions and field trips emphasize architectural implications of materials and methods of construction. 2 seminars, 1 activity. Prerequisite: Third-year standing.

**LA 321 Concepts in Environmental Decision Making (3)****GEB F.2.**

Investigation of theoretical and attitudinal bases of environmentally concerned disciplines. Ecology, perception, behavior and design studies as organizational principles and theories in developing understanding of interface between built and natural environments. 3 lectures.

**LA 341, 342, 343 Landscape Architecture Construction (3) (3) (3)**

Theory and application of landscape architectural construction working drawings, specification, cost estimation, codes, regulations, and contractual agreements. Landscape architecture practice as a profession. 3 laboratories. Prerequisite: LA 231; ARCE 311 for LA 341. Concurrent: LA 351, LA 352, LA 353.

**LA 344 Form and Materials (3)**

Development of understanding of contemporary materials and their use in design development. Direct working experience with three dimensional design related to stone, metal, wood, glass, clay and plastics. 3 laboratories. Prerequisite: Third-year standing or consent of instructor.

**LA 347 Landscape Plant Composition (3)**

Plant characteristics and ecological conditions as constraints and opportunities for the landscape architect. Selection of plant materials for design effect. 3 laboratories. Prerequisite: LA 203, BOT 238, OH 239.

**LA 348 Advanced Landscape Plant Composition (3)**

Preparation of landscape planting contract documents. Emphasis on understanding installation, maintenance, and irrigation of planted areas as related to design and composition. 3 laboratories. Prerequisite: LA 341, LA 347, LA 351.

**LA 351, 352 Design for Landscape Architects (4) (4)**

Development of creative abilities for solving landscape problems. Emphasis on logical analysis and application of design skills. 4 laboratories. Prerequisite: LA 203, LA 213. Concurrent: LA 341, LA 342, LA 343.

**LA 353 Design for Landscape Architects (4)**

Completion of design project, selected by instructor, of sufficient scale and complexity to encompass most fundamental design and technical decisions common to landscape architectural construction projects. Conceptual, design development, and working drawings prepared as a complete set. Outline specifications and cost estimates prepared. 4 laboratories. Prerequisite: LA 342, LA 352. Concurrent: LA 343, LA 348, LA 441.

**LA 363 Recreation and Open Space Planning and Design (3)**

Planning and design methods for meeting leisure requirements; issues of recreation and society; relationship of recreation and open spaces; assessment of needs and supply of resources. 3 lectures. Prerequisite: Must have completed minimum of one 200-level course in planning, design or recreation and third-year standing or consent of instructor.

**LA 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**LA 410 Information Systems for Landscape Architecture (2)**

Introduction and hands-on experience with computerized spatial information systems utilized in design and planning. Emphasis on existing computer programs for use on both micro computers and the campus computing facilities. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and fourth-year standing or consent of instructor.

**LA 411 Regional Landscape History (3)**

Developmental history of the landscape in the western region with specific focus on the Basin and Range and Pacific regions. 3 lectures. Prerequisite: Fourth-year standing or consent of instructor.

**LA 441, 442 Professional Practice (2) (2)**

Office organization, contract documents and specifications. Ethics, problems and practices in the profession of landscape architecture. 2 activities. Prerequisite or concurrent: LA 343, LA 353, third-year standing or consent of instructor.

**LA 451, 452 Design for Landscape Architects (5) (5)**

Continuation of LA 353 emphasizing individual initiative and responsibility in solving problems of increased complexity. 5 laboratories. Prerequisite: LA 343, LA 353.

**LA 453 Advanced Landscape Architecture Design (5)**

Student selection and completion of approved design or research project sufficient in scale and complexity to encompass issues common to landscape architecture. Time management, documentation, and communication skills emphasized. 5 laboratories. Prerequisite: LA 343, LA 353, fourth-year standing. Recommended or concurrent: LA 348, LA 441, LA 442.

**LA 461 Senior Project (3)**

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. 90 hours minimum total time. Prerequisite: LA 343, LA 353.

**LA 463 Undergraduate Seminar (2) (CR/NC)**

Discussion and lectures on problems of practice in the environmental design field. Professional ethics. Students present organized material on some subject of interest in landscape architecture. Credit/No Credit grading. 2 seminars. Prerequisite: Fourth-year standing in degree major.

## 432 MATH

### LA 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

### LA 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

## LIB—LIBRARY

### LIB 101 Library Instruction (1)

Instruction and practice in the use of the card catalog, reference books, periodical indexes, government documents, and other library materials. Development of student independence and initiative in using the library as a source of information. 1 lecture.

### LIB 301 Library Resources and Literature Searches (1)

Sources of information in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, periodicals, serials, and other sources. Techniques used in literature searches and preparation of bibliographies. Class schedule will list major subject area covered. Total credit limited to 3 units. 1 lecture. Prerequisite: Junior, senior or graduate standing or consent of instructor.

## LS—LIBERAL STUDIES

### LS 301 Elementary School Field Experience (1) (CR/NC)

Supervised observation and participation three hours per week in elementary schools, including experiences as a teacher aide. Credit/No Credit grading only. Repeatable to a maximum of 2 units.

### LS 461 Senior Project (3)

Selection and completion of a project or report under faculty supervision. Topic must be chosen with departmental approval. Results must be presented in a formal, written report. Prerequisite: Advanced composition, senior standing, and consent of Liberal Studies Coordinator.

## MATH—MATHEMATICS

Satisfactory completion of the Entry Level Mathematics requirement is a prerequisite for enrollment in all mathematics courses.

### MATH 101 Orientation to the Mathematics Major (1) (CR/NC)

Career opportunities in the field of mathematics, designing a career goal, and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading. 1 lecture.

### MATH 102 Agricultural Mathematics (3)

Percentage problems in soils, dairy, horticulture, poultry, feeds, discount and interest, Pearson's square, equations, formulas, dimensional analysis, linear measurements, areas, volumes and proportions; concrete and lumber problems. 3 lectures.

### \* MATH 103 Agricultural Mathematics (3)

Use of exponents, logarithms and trigonometric functions; basic land descriptions and measurement; mathematics of finance; basic statistics; work, horsepower and efficiency, pressure. Not open to students with credit in MATH 115, MATH 119, MATH 120 or courses for which these are prerequisites. 3 lectures. Prerequisite: Two years of high school algebra or equivalent.

\* Not open to students having a grade of C or better in MATH 141 or equivalent.



**MATH 105 Hand-Held Calculators (1)**

Operation of multi-function programmable calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

**\* MATH 113 Algebra (3)**

Real number system; polynomials and factoring; complex fractions; linear equations and inequalities; Cartesian coordinates and the distance formula; linear functions and their graphs; exponents and radicals; quadratic equations and functions; applications of linear and quadratic equations. Not open to students with credit in MATH 114, MATH 118, MATH 120 or courses for which these are prerequisites. 3 lectures. Prerequisite: One year of high school algebra and successful completion of the ELM requirement.

**\* MATH 114 College Algebra (3)**

GEB B.2.

Continuation of Math 113. Variation; systems of equations; determinants and solution of systems of equations; solution of systems of inequalities and linear programming; inverses of functions; exponential and logarithmic functions; complex numbers; the remainder and factor theorems; arithmetic and geometric series; binomial theorem; applications where suitable. Not open to students with credit in MATH 118, MATH 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: MATH 113 or equivalent.

**\* MATH 115 Trigonometry (3)**

GEB B.2.

Trigonometric functions of acute angles and related angles; graphs, radian measure, fundamental identities, functions of two angles, applications of right and oblique triangles, and logarithmic applications. Not open to students with credit in MATH 119 or 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: MATH 114 or equivalent.

**\* MATH 118 Pre-Calculus Algebra (4)**

GEB B.2.

Pre-calculus college algebra without trigonometry. Special products and factoring; exponents and radicals; partial fractions; fractional and quadratic equations; determinants; systems of equations; graphing; inequalities and absolute value; mathematical induction; binomial theorem; logarithms; complex numbers. Not open to students with credit in MATH 120. 4 lectures. Prerequisite: MATH 113 or equivalent.

**\* MATH 119 Pre-Calculus Trigonometry (3)**

GEB B.2.

Rectangular and polar coordinates; trigonometric functions, fundamental identities; inverse trigonometric functions and relations; complex numbers. Not open to students with credit in MATH 115 or 120. 3 lectures. Prerequisite: MATH 118 or equivalent.

**\* MATH 120 College Algebra and Trigonometry (5)**

GEB B.2.

An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular coordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. 5 lectures. Prerequisite: 1½ years of high school algebra and trigonometry.

**MATH 121 Finite Mathematics (3)**

Sets and counting problems. Probability theory including stochastic processes, probability distributions, and Markov Chains. The algebra of vectors and matrices, Gaussian elimination, and the inverse of a square matrix. Applications of matrices. 3 lectures. Prerequisite: MATH 118 or equivalent.

**† MATH 131, 132, 133 Technical Calculus (4) (4) (4)**

Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. Not open to students with credit in MATH 142, MATH 143, MATH 318 (respectively) or equivalents. 4 lectures. Prerequisite: MATH 118 and MATH 119 or equivalent.

\* Not open to students having a grade of C or better in MATH 141 or equivalent.

† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

## 434 MATH

### MATH 141 Analytic Geometry and Calculus (4)

Introduction to analytic geometry and calculus. 4 lectures. Prerequisite: MATH 118 and MATH 119 or equivalent.

### MATH 142 Analytic Geometry and Calculus (4)

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 141.

### MATH 143 Analytic Geometry and Calculus (4)

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 142.

### MATH 170 Theory of Equations (2)

Properties of polynomials, rational solutions, partial fractions, complex roots, symmetric functions, numerical solutions. 2 lectures.

### MATH 201 Appreciation of Mathematics (3)

Contemporary mathematics and the relationship between mathematics and our cultural heritage. Intended to develop an appreciation for the role that mathematics plays in society, both past and present. 3 lectures.

### MATH 204 Mathematics of Matrices (3)

Matrices, inverses, linear systems, characteristic values, applications. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

### MATH 221 Calculus for Business and Economics (4)

Polynomial calculus for optimization and marginal analysis; partial derivatives and elementary integration. Not open to students with credit in MATH 143, MATH 133 or equivalent. 4 lectures. Prerequisite: MATH 118 or equivalent.

### MATH 222 Mathematical Analysis for Economics and Business (4)

Multivariate calculus, Lagrange multipliers; linear algebra and determinants; differential and difference equations. 4 lectures. Prerequisite: MATH 221 or equivalent.

### MATH 241 Analytic Geometry and Calculus (4)

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 143.

### MATH 242 Differential Equations (4)

Ordinary differential equations: introduction with applications in engineering and science; classification of equations and their analytic solutions; study of interrelationships between differential systems, graphs, and physical problems. 4 lectures. Prerequisite: MATH 241.

### MATH 245 Discrete Structures (3) (Also listed as CSC 245)

Introduction to discrete mathematical structures used in computing. Algorithms and recursion; graphs and trees; Turing machines; computability and complexity. 3 lectures. Prerequisite: CSC 118 or equivalent.

### MATH 248 Methods of Proof in Mathematics (3)

Methods of proof (direct, contradiction, conditional, contraposition); examples from set theory; quantified statements and their negations; functions, indexed sets, set functions; proofs in analysis; proof by induction; equivalence and well-defined operations and functions; the axiomatic method. 3 lectures. Prerequisite: MATH 143.

### MATH 304 Vector Analysis (4)

Algebra of free vectors with applications. Differential and integral calculus of vectors. Development of theory and application of vector operations. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. 4 lectures. Prerequisite: MATH 242.

### MATH 312 Linear Algebra (4)

Vector spaces, linear transformations, linear independence, matrix algebra, linear algebraic systems, determinants, eigenvalues, eigenvectors. 4 lectures. Prerequisite: MATH 143.

**MATH 313 Linear Algebra (4)**

Bilinear and quadratic forms, unitary operators, spectral decomposition, Sylvester's Theorem, Jordan-Canonical Form, applications to other fields. 4 lectures. Prerequisite: MATH 312.

**MATH 317 Topics in Engineering Mathematics (4)**

Fourier series, Fourier transforms, discrete Fourier transforms and their properties. Probabilities concepts associated with random phenomena encountered in engineering. 4 lectures. Prerequisite: MATH 242.

**MATH 318 Advanced Engineering Mathematics (4)**

Power series solutions of differential equations and Bessel functions. Fourier series and transform; matrices. 4 lectures. Prerequisite: MATH 242.

**MATH 319 Partial Differential Equations (4)**

Mathematical formulation of physical laws. Separation of variables. Orthogonal functions and generalized Fourier series. Bessel functions, Legendre polynomials. Sturm Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. 4 lectures. Prerequisite: MATH 318.

**MATH 320 Systems of Differential Equations (4)**

Matrix analysis, eigenvectors, eigenvalues, exponential matrix and canonical forms. Analysis of linear and nonlinear systems of differential equations: Gronwall inequality, fundamental matrix, variation of constants formula, asymptotic behavior of solutions, phase plane analysis, stability and applications to physical problems from science and engineering. 4 lectures. Prerequisite: MATH 242.

**MATH 327, 328, 329 Modern Elementary Mathematics (3) (3) (3)**

328:GEB B.2.

Development of set theory, number systems, probability and statistics and geometry. Emphasis on activity learning and applications to elementary teaching. Computer applications. MATH 327, 2 lectures, 1 activity; MATH 328, MATH 329, 3 lectures. Prerequisite: MATH 113 or equivalent.

**MATH 335 Graph Theory (3)**

Sets, permutations and combinations, finite graphs and digraphs, Euler paths and Hamiltonian paths, matrix representation of graph, connectedness, isomorphism, planar graphs, trees, applications. 3 lectures. Prerequisite: Junior standing.

**MATH 336 Combinatorial Mathematics (3)**

Permutations and combinations; generating functions; recurrence relations; inclusion and exclusion; Polya's theory of counting; transport networks; matching theory; block design. 3 lectures. Prerequisite: MATH 143 or equivalent.

**MATH 341 Theory of Numbers (4)**

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 or consent of instructor.

**† MATH 381, 382 Modern Algebra (4) (4)**

Fundamental algebraic structures and types of algebras, including operations within them and relations among them. Groups, rings and fields. 4 lectures. Prerequisite: MATH 248.

**MATH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

† Each course is a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 403 Issues in Secondary School Mathematics Education (3)**

Introduction to issues of importance in the professional development of prospective teachers of secondary school mathematics. History of mathematics education, current trends in curriculum and methods, recent results from the research in mathematics education, introduction to the professional literature. 3 lectures. Prerequisite: Junior standing.

**MATH 405 Transform Engineering Methods (3)**

Applications of Z-transforms to engineering problems. Clarifying and unifying concepts of Z-transforms as found in mechanical engineering, marketing, maintainability, reliability, finance, inventory control, production control, forecasting, and Poisson processes. 3 lectures. Prerequisite: MATH 242 and upper division standing.

**MATH 408 Functions of a Complex Variable (4)**

Elementary analytic functions and mapping; Cauchy's Integral Theorem; Power series; theory of residues and evaluation of integrals; harmonic functions. 4 lectures. Prerequisite: MATH 242.

**MATH 409 Complex Analysis (4)**

Further development of analytic function theory. Additional topics in calculus of residues, conformal mapping and the Poisson Integral. 4 lectures. Prerequisite: MATH 408.

**† MATH 412, 413, 414 Advanced Calculus (4) (3) (3)**

Introduction to concepts and methods basic to real analysis. Topics such as real number system, continuity, uniform continuity, differentiation, the integral, uniform convergence, partial differentiation, multiple integration, implicit and inverse function theorems. MATH 412, 4 lectures; MATH 413, 414, 3 lectures. Prerequisite: MATH 248.

**MATH 419 Introduction to History of Mathematics (3)**

Evolution of mathematics from earliest to modern times. Contributions of prominent mathematicians. Development of mathematical concepts and techniques. Appropriate for prospective and in-service teachers. 3 lectures. Prerequisite: MATH 143.

**MATH 424 Organizing and Teaching Mathematics (3)**

Organization, selection, presentation, application and interpretation of subject matter in mathematics. For students who will be teaching in secondary schools. 3 lectures. Prerequisite: MATH 403.

**† MATH 431, 432 Mathematical Optimization I-II (3) (3)**

Classical optimization: max/min of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 3 lectures. Prerequisite: CSC 219 and MATH 312 or consent of instructor.

**MATH 435 Teaching Mathematics in the Elementary School (3)**

Development of mathematical concepts; the discovery or laboratory approach to learning and the role of manipulative or visual materials; teaching the mathematical rationale of fundamental operations; necessity for a sequential and organized program; the newer curricular materials and their place in the total program; problem solving; evaluation. 3 lectures. Prerequisite: ED 305 and MATH 327 or consent of instructor.

**MATH 437 Game Theory (3)**

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form. 3 lectures. Prerequisite: MATH 312 or consent of instructor.

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† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same thing.

**MATH 442 College Geometry (3)**

Modern development of the basic concepts of plane and solid Euclidean geometry including a coordinate treatment; selected topics in advanced Euclidean geometry. 3 lectures. Prerequisite: MATH 248 and junior standing.

**MATH 443 Non-Euclidean Geometry (3)**

Review of attempts to prove Euclid's fifth postulate as a point of departure in the discovery of non-Euclidean geometry; building an axiom system free of intuitive prejudice; hyperbolic plane trigonometry. Particularly appropriate for the prospective or in-service teacher. 3 lectures. Prerequisite: MATH 442.

**MATH 444 Projective Geometry (3)**

Geometric and algebraic treatment of such topics as primitive forms, ideal elements, incidence and duality. Certain geometric properties preserved by projections; and construction of special figures. 3 lectures. Prerequisite: At least junior standing. MATH 442 recommended.

**MATH 459 Undergraduate Seminar (2)**

Reports and discussions by students, through seminar format, on topics in mathematics education, applied mathematics, or finite mathematics. 2 seminars. Prerequisite: MATH 242 and either MATH 312 or MATH 381.

**† MATH 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: MATH 459.

**MATH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**MATH 505 Foundations of Mathematics (4)**

Development of the primitive materials and concepts necessary to an understanding of the axiomatic method dealing with sets and logic. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**MATH 506 Topics in Modern Algebra (4)**

Topics selected from group theory, ring theory, unique factorization, group representation, module theory and linear algebra. 4 seminars. Prerequisite: MATH 382 and MATH 312 or equivalent and graduate standing.

**MATH 507 Structure of Geometry (4)**

Transformations and geometries; affine, topological and analytic. Appropriate for the prospective or in-service teacher. 4 seminars. Prerequisite: Graduate standing or consent of instructor; MATH 442 recommended.

**MATH 508 Introduction to Topology (4)**

Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 4 seminars. Prerequisite: MATH 412 and graduate standing or consent of instructor.

**MATH 510 Survey of Modern Mathematics (4)**

Selected topics from the field of modern mathematics: projective, and synthetic geometry, topology, logic, matrices, vectors, theory of games, probability, linear and modern algebra and convex sets, Boolean algebras, graph theory, Lattice theory, geometry of complex numbers. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

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† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

† MATH 512, 513 Partial Differential Equations of Physical Systems (4) (4)

Partial differential equations of first and second order. Laplace's equation, wave equation, diffusion equation and others; methods for their analytical solution. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

MATH 515 Real Analysis (4)

Introduction to Lebesgue measure and integration, convergence theorems,  $L_1$  spaces, Radon-Nikodym theorem and Fubini's theorem. 4 seminars. Prerequisite: MATH 413 and MATH 508 or consent of instructor.

MATH 516 Linear Operators (4)

Linear spaces, operator theory and operational calculus. Applications to differential equations, integral equations, transforms and Fourier analysis. 4 seminars. Prerequisite: MATH 515 and graduate standing or consent of instructor.

MATH 518 Advanced Ordinary Differential Equations (4)

Existence, continuation and dependence on parameters of solutions. Linear systems, initial and boundary value problems. Self-adjoint eigenvalue problems. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

MATH 519 Topics in History of Mathematics (4)

Selected topics in the development of concepts and techniques in mathematics from earliest times to the present. May be repeated up to a total credit of 8 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

MATH 580 Seminar (1-4)

Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. 1 to 4 seminars. Total credit limited to 12 units. Prerequisite: Graduate standing and consent of instructor.

MATH 596 Thesis (3) (3)

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Prerequisite: Graduate standing and consent of instructor.

## ME—MECHANICAL ENGINEERING

ME 134 Mechanical Systems (3)

Analysis, synthesis, and testing of mechanical systems, their components and instruments. 2 lectures, 1 laboratory.

ME 136 Thermal Systems (3)

Analysis and synthesis of thermal systems, their components and instruments. 2 lectures, 1 laboratory.

ME 211 Engineering Statics (3)

Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241 (or concurrently), PHYS 131.

ME 212 Engineering Dynamics (4)

Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 4 lectures. Prerequisite: MATH 241, ME 211.

**ME 221 Solar Energy (3)**

GEB F.2.

Methods of utilizing solar energy. Energy concepts. Collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation; measurements; recent technical developments and literature. 3 lectures. Prerequisite: PHYS 121, PHYS 122, PHYS 123 or equivalent.

**ME 302 Thermodynamics I (3)**

Properties and fundamental relations for processes involving gases and vapors. First and second laws of thermodynamics. 3 lectures. Prerequisite: PHYS 132, MATH 143, CHEM 122 or CHEM 125, ENGR 251 or equivalent.

**ME 303 Thermodynamics II (3)**

Power and refrigeration cycles. Property relations for real gases. Mixtures of gases and vapors, psychrometry combustion. 3 lectures. Prerequisite: ME 302, ENGR 251.

**ME 313 Heat Transfer (3)**

Basic principles of heat transfer. Radiation, conduction and convection in gasses and liquids during forced and gravity flow conditions, behavior of heat exchangers. 3 lectures. Prerequisite: ME 302 or CHEM 305, MATH 242, ENGR 251 or equivalent.

**ME 316 Mechanical Vibrations (3)**

Free vibration, damping, transient and steady state response to forced vibrations. Engineering methods, single and multiple degrees of freedom. 3 lectures. Prerequisite: MATH 317 or MATH 318, ME 212, ENGR 251 or equivalent.

**ME 317 Vibrations Laboratory (1)**

Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. Analog techniques. 1 laboratory. Concurrent: ME 316. Prerequisite or concurrent: EE 201 or EE 212.

**ME 322 Solar Energy Engineering (3)**

Radiation measurement and estimation at earth's surface. Radiation properties of opaque and transparent materials. Flat plate and focusing collectors. Energy storage. Heating and cooling of buildings. Solar power and distillation. 3 lectures. Prerequisite: ENGR 251 or equivalent, ENVE 221, ENVE 313, ME 302 or CHEM 305. Concurrent: ME 341.

**ME 324 Kinematics (4)**

The study of motion in machine parts. Displacements, velocities, and accelerations in linkage, cams, gears, and other mechanisms using computer analysis. 2 lectures, 2 two-hour laboratories. Prerequisite: ETME 141, ME 212, ENGR 251 or equivalent.

**ME 327 Introduction to Design (5)**

Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of gears, clutches, brakes, bearings, shaft and other machine parts. Modern industrial design practice using standard components and design layout drawings. 4 lectures, 1 laboratory. Prerequisite: CE 206 (or concurrent), CE 207, ETME 141, MET 306.

**ME 341, 342 Fluid Mechanics (3) (3)**

Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 3 lectures. Prerequisite: ME 341, ENGR 251.

**ME 343 Thermodynamics Laboratory (1)**

Experimental methods applied to the evaluation of machine performance, processes and verification of theory. Thermodynamic processes, heat transfer characteristics, and combustion phenomena. Planning experiments, interpretation of results, preparation of reports. 1 laboratory. Prerequisite: ME 303, ME 342, ME 136, ME 313, ENGR 251 or equivalent.

**ME 345 Fluid Mechanics Laboratory (1)**

Fluid mechanics experiments in pipe flow, flow measurement, turbomachinery, lift and drag, nozzle flow, and applications of the conservation equations of fluid mechanics. 1 laboratory. Prerequisite: ME 342.

**ME 350 Thermal Environmental Engineering (4)**

Physiological aspects of the thermal environment, heating and cooling loads, moist air properties and psychrometric processes, combined heat and mass transfer processes. 4 lectures. Prerequisite: ME 302, ME 313.

**ME 351 Active Solar System Analysis and Design (4)**

Insolation estimation at earth's surface. Radiation properties of opaque and transparent materials. Solar collector analysis. Energy storage. Active system simulation and design. Applications to building environmental control and process heat. 4 lectures. Prerequisite: ME 313, ME 341, ENGR 251.

**ME 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ME 401 Stress Analysis (4)**

Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: CE 209, ENGR 251, MATH 318.

**ME 415 Energy Conversion (4)**

Engineering aspects of energy source, conversion and storage, including an energy system design project. 4 lectures. Prerequisite: ME 302.

**ME 422 Mechanical Control Systems (4)**

Analytical modeling and compensation of mechanical control systems. Design of mechanical, hydraulic and fluid systems using analog and digital simulation techniques. 3 lectures, 1 laboratory. Prerequisite: ME 316, ME 317.

**ME 424, 425 Design of Piping Systems (4) (4)**

Functions, requirements, and design of piping systems, including safety and economic considerations for power, chemical, and process plants. Welding and other forms of joint construction, materials specifications, sizing, layout, flexibility, support, insulation, and cost estimation of water, steam, air, gas, and corrosive and viscous fluid systems. Philosophy, background, and requirements of principal governing National Codes. 3 lectures, 1 laboratory. Prerequisite: CE 207, ME 341, ENGR 251.

**ME 428 Design (4)**

Basic design techniques such as brainstorming, feasibility studies, models, case studies, design decisions and compromises. Industrial participation design program. 2 lectures, 2 laboratories. Prerequisite: ME 324, ME 327, ENGR 251.

**ME 431 Mechanical Design Technique (4)**

Comprehensive study of various design methods and techniques. Optimization techniques used to explore various structural concepts such as prestressing, statistical screening, decision modeling. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory. Prerequisite: ME 316, ME 327.

**ME 432 Petroleum Reservoirs (4)**

Types of reservoirs and reservoir rocks. Measurement and interpretation of physical properties of reservoir rocks and fluids porosity, permeability, compressibility, electrical resistivity, fluid saturation, viscosity, solution gas. Introduction to flow in porous media and well logging. 4 lectures. Prerequisite: ME 341.



**ME 434 Petroleum Recovery Methods (4)**

Primary, secondary, and tertiary (enhanced) oil recovery methods. Material balance calculations, waterflooding, gas injection, steam injection, in-situ combustion, chemical flooding. Performance calculations. 4 lectures. Prerequisite: ME 341.

**ME 435 Petroleum Production Development (4)**

Theory and practice of oilwell planning, drilling and completion applied to the development of new oil production. Planning and operation of offshore deep water drilling systems. 4 lectures. Prerequisite: ME 327.

**ME 436 Petroleum Production Surface Operation (4)**

Design, operation and maintenance of surface equipment required in oil production. Processes and systems involved are well pumping, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in processes of water flood, steam stimulation and in situ combustion. 4 lectures. Prerequisite: ME 342.

**ME 438 Heat Exchanger Design (4)**

Theory and application of numerical, analytical, and experimental methods to selected heat transfer problems. Application of principles of conduction, convection, condensation, and boiling heat transfer, stress, and vibrations to design of heat exchange equipment. 4 lectures. Prerequisite: ME 303, ME 313, ME 342, ENGR 251.

**ME 440 Thermal System Design (3)**

Techniques used to design thermal systems. Economic considerations, mathematical modeling, and simple optimization techniques in performance analysis of thermal systems. 2 lectures, 1 laboratory. Prerequisite: ME 303, ME 313, ME 342, IE 314 and ENGR 251.

**ME 443 Turbomachinery (4)**

Performance characteristics. Two-dimensional cascades. Axial flow turbines. Axial flow compressors, pumps and fans. Three-dimensional flows in axial turbomachines. Centrifugal pumps, fans and compressors. 4 lectures. Prerequisite: ME 303, ME 342, MATH 318.

**ME 444 Combustion Engine Design (4)**

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Energy conversion including losses and cooling. Static and dynamic loading. 3 lectures, 1 laboratory. Prerequisite: ME 303.

**ME 445 Convective Heat and Mass Transfer (4)**

Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 313, ME 341.

**ME 450 Solar Power Systems (4)**

Recommend as complement to ME 415. High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 313.

**ME 451 Passive Solar System Analysis and Design (3)**

Performance analysis of passive systems applied to building environmental control. Dynamics of massive thermal systems. Simulation and correlation techniques in system design. Use of packaged CAD programs. 3 lectures. Prerequisite: ME 351.

**ME 452 Solar Engineering Design (2)**

Project work in designing active and passive thermal environmental control and industrial process heating and cooling systems. Selected system designs involving case and feasibility studies, component selection, economic and performance analysis and design drawings. 1 lecture, 1 laboratory. Prerequisite: ME 351.

## 442 ME

### ME 455 Thermal Environmental Experimentation (2)

Experimental determination of the performance of various thermal and solar devices including a direct expansion coil, refrigeration compressor, ventilation fan, a liquid cooled solar collector and an air cooled solar collector. Report writing, error analysis and statistical interpretation of experimental data. 1 lecture, 1 laboratory. Prerequisite: ME 303, ME 351.

### ME 456, 457, 458 HVAC System Design (3) (3) (3)

Individual and team project work (including computer simulation) in designing systems, selecting equipment, estimating energy consumption and operating cost for applications in: ME 456, industrial ventilation, exhaust and pollution control; ME 457, commercial and industrial refrigeration; ME 458, commercial and industrial heating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 341, ME 350, EE 201.

### ME 459 Advanced Thermal Environmental System Design (3)

Refrigeration cycles, systems and equipment; energy requirements and operating cost; design parameters for air conditioning and low temperature applications. Heat conservation and recovery strategies. 2 lectures, 1 laboratory. Prerequisite: ME 303, ME 350, EE 201.

### ME 461, 462 Senior Project (2) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

### ME 463 Undergraduate Seminar (2)

New developments, policies, practices, and procedures discussed through regular seminar. Each individual responsible for the development and presentation of a topic in the chosen field. 2 seminars. Prerequisite: Senior standing.

### ME 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### ME 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### ME 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

### ME 502 Stress Analysis (4)

Approximate methods of stress analysis. Energy methods, applications to one- and two-dimensional stress fields. 3 lectures, 1 laboratory. Prerequisite: ME 401, graduate standing or consent of instructor.

### ME 517 Advanced Vibrations (4)

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 316, ENGR 251, graduate standing or consent of instructor.

### ME 526 Dynamics of Mechanical Systems (4)

Analysis of dynamic problems in machine design. 3 lectures and 1 two-hour activity. Prerequisite: ME 316, ME 324, and graduate standing or consent of instructor.

**ME 541 Advanced Thermodynamics (4)**

Selected modern applications of thermodynamics which may include topics from: 1) Equilibrium and kinetics as applied to combustion and air pollution. Analysis and evaluation of techniques used to predict properties of gases and liquids. Energy reduction techniques for industrial and commercial operations. 2) Improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 303, ENGR 251, and graduate standing or consent of instructor.

**ME 542 Dynamics and Thermodynamics of Compressible Flow (4)**

Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures. Prerequisite: MATH 242, ME 303, ME 342, and graduate standing or consent of instructor.

**ME 550 Kinematic Analysis and Design (3)**

Analysis and design of mechanical linkages by means of geometric and algebraic methods. Optimization studies. 3 seminars. Prerequisite: ME 324 and graduate standing or consent of instructor.

**ME 551 Mechanical Systems Analysis (3)**

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ME 552 Conductive Heat Transfer (3)**

Theory of steady-state and transient conduction in isotropic and anisotropic media. Development of differential equations, solutions by series, conformal mapping, transforms, finite differences. Concentrated and distributed heat sources. 3 seminars. Prerequisite: ME 303, ME 313, ME 342, MATH 318, and graduate standing or consent of instructor.

**ME 553 Convective Heat Transfer (3)**

Analysis of convective transfer of energy, mass and momentum. High speed flow and ablation. Phase change heat transfer. 3 seminars. Prerequisite ME 313, ME 342, MATH 318, and graduate standing or consent of instructor.

**ME 556 Stability of Structural Systems (3)**

Static and dynamic analysis of structural and mechanical systems, stability analysis by solution of differential equations, energy methods, perturbation methods. Buckling of columns, torsional buckling, dynamic buckling. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ME 599 Design Project (Thesis) (2)(2) (5)**

Each individual or group will be assigned an industrial project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. An appropriate experimental or analytical thesis may be accepted.

**MET—METALLURGICAL ENGINEERING****MET 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**MET 222 Physical Metallurgy (5)**

Introduction to physical metallurgy of major ferrous alloy systems. Crystal structure and bonding, equilibrium diagrams, phase transformations, ITT diagrams, hardenability and heat treatment. Steel mill, foundry and welding metallurgy. Metallurgical laboratory practices, mechanical testing, metallurgical calculations and engineering reports. 3 lectures, 2 laboratories. Prerequisite: MET 235 or MET 306 or consent of instructor.

## 444 MET

### MET 223 Physical Metallurgy (4)

Introduction to the physical metallurgy of major nonferrous alloy systems, copper, aluminum, nickel, cobalt and titanium, extractive and refining metallurgy, casting, joining metallurgy, strengthening mechanisms, mechanical properties, mechanical working and recrystallization, corrosion resistance. 3 lectures, 1 laboratory. Prerequisite: MET 222.

### MET 235 Metallurgy for Engineering Technology (4)

Physical and mechanical properties of metals and alloys. Selection, heat treatment, and use of metals and alloys. Steel, cast iron, stainless steel, and nonferrous alloys. Fabrication problems and their solution. 3 lectures, 1 laboratory. Prerequisite: CHEM 121 and sophomore standing in Engineering Technology.

### MET 301 Physics of Metals (3)

Solid state theory of materials as pertaining to crystallography, internal energy, interatomic bonding, specific heat, thermal expansion, thermal conductivity, electrical conductivity, semiconductors, magnetism, temperature effects and diffusion. 3 lectures. Prerequisite: MET 306, MATH 241, PHYS 133, ME 211, CHEM 125 or consent of instructor.

### MET 302, 303 Mechanical Metallurgy (4) (4)

Uniaxial and complex static stress, stress strain elastic and plastic relationships, mechanical property tests, mechanisms of plastic deformation, dislocation theory, strengthening mechanisms, fracture; brittle, ductile and high temperature, fatigue, creep, stress-rupture, strain rate effects, environmental effects. 3 lectures, 1 laboratory. Prerequisite: MET 301, ENGR 251 or equivalent, CE 204, CE 205, CE 206 or consent of instructor.

### MET 306 Materials Engineering (3)

Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomena. 3 lectures. Prerequisite: Sophomore standing in major, PHYS 131, CHEM 124 or consent of instructor.

### MET 324, 325, 326 Metallurgical Engineering (4) (4) (4)

Effect of alloying elements in steel. Heat treatment, atmosphere furnaces, bright annealing, carbon restoration. Failure analysis and prevention, advanced metallography including electron microscopy. Theory and application of nondestructive examination. 2 lectures, 2 laboratories. Prerequisite: MET 223, ENGR 251 or equivalent.

### MET 341 Materials Engineering Laboratory (1)

Laboratory experiments with materials. Heat treating of steel and aluminum alloys and mechanical evaluation. Identification of microstructures, corrosion testing, cold working and annealing, cooling curves and impact testing. 1 laboratory. Prerequisite or concurrent: MET 306.

### MET 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

### MET 421, 422, 423 Metallurgical Thermodynamics (4) (4) (4)

Physical chemistry of metals, thermodynamics of liquid and solid metallic systems, metallurgical kinetics, mass and energy balances in high temperature metallurgical reactions, steelmaking, solidification, diffusion theory, recovery, recrystallization and grain growth, solid state transformations, computer applications. 4 lectures. Prerequisite: CHEM 306, MET 303, and MET 326 or consent of instructor.

### MET 424, 425, 426 Applied Metallurgical Engineering (3) (3) (3)

Fracture mechanics, fatigue, environment assisted cracking, galvanic corrosion, corrosion testing, corrosion control. X-ray diffraction, nonmetallic systems, computer applications. 2 lectures, 1 laboratory. Prerequisite: MET 303, MET 326, CHEM 306.

**MET 434 Welding Engineering Laboratory (3)**

Weldability studies of high strength, low alloy steels and the important metallurgical aspects of welded fabrication. 3 laboratories. Prerequisite: MET 306 and senior standing in Metallurgical or Mechanical Engineering.

**MET 435 Welding Engineering (3)**

Principles of welded pressure vessel design and fabrication in accordance with governing codes. Material selection, process selection, procedure. Performance qualifications of pressure vessels; cost estimating. 1 lecture, 2 laboratories. Prerequisite: MET 434.

**MET 436 Welding Engineering (3)**

Weldability and metallurgical studies of aluminum and aluminum alloys, stainless and heat resisting steels, and titanium and titanium alloys. Principles of process selection. 1 lecture, 2 laboratories. Prerequisite: MET 435.

**MET 441, 442, 443 Metallurgy of Complex Alloys Laboratory (1) (1) (1)**

Laboratory examination of properties and microstructure—optical and SEM, of superalloys, stainless steels, titanium alloys, tool steels, dual phase steels. 1 laboratory. Prerequisite: MET 303, MET 326.

**MET 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**MET 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**MET 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**MET 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser, or supervising faculty member.

**MET 562 Mechanical Metallurgy (3)**

Analysis of stress and strain in solids; elements of theory of elasticity and plasticity, and their applications to metal forming. Residual stresses, theory of dislocations, theory of recrystallization, effects of temperature and rate of loading; fracture mechanics, fatigue and creep. 3 seminars. Prerequisite: MET 306, graduate standing, or consent of instructor.

**MET 564 Fracture Mechanics and Stress Corrosion Cracking (3)**

Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing, fail safe design, the use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 seminars, 1 laboratory. Prerequisite: MET 306, CE 205, CE 206, and graduate standing or consent of instructor.

**MET 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned an industrial project for solution under faculty supervision as a thesis requirement for the Master of Engineering degree. Appropriate experimental or analytical thesis may be accepted.

## MGT—MANAGEMENT

### MGT 118 Introduction to Human Relations in Business (3)

Small group dynamics, leadership, communication, motivation, and perception. The individual in the business organization. For nonbusiness majors. 3 lectures.

### MGT 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### MGT 201 Principles of Management (3)

Management process involving organization, decision-making, and managerial activities fundamental to all management levels and functional areas. Application to business firms, governmental agencies, hospitals, benevolent groups, and colleges. 3 lectures. For nonbusiness majors.

### MGT 206 Principles of Purchasing (3)

Purchasing function applied to manufacturing, retailing, and food-service institutions. Its interdependence with other functional areas of the organization. 3 lectures. For nonbusiness majors.

### MGT 306 Purchasing Management (4)

Role and scope of the procurement function and concept of an integrated materials management process. Relations with functional departments. Purchasing structure and processes in business and service organizations. Global concept of international purchasing. Measuring purchasing performance. 4 lectures. Prerequisite: Junior standing.

### MGT 310 The Labor Movement in the United States (4)

Labor movement theories, American trade union development, union management, labor and economic political power, variations in labor movements. Union issues in private and public sectors. 4 lectures. Prerequisite: Junior standing.

### MGT 311 Industrial Management (4)

Organization and functioning of management in industry. Planning, direction, and control of the business enterprise in terms of policy formation, organizational structure, finance, sales, procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior standing.

### MGT 312 Organization and Management Theory (4)

Examination of the structural and configurational components of formal organizations. Analysis of management theory development, concepts of organizational processes and managerial strategies. Application of organizational and management imperatives to formal organizational structures and functions. 4 lectures. Prerequisite: Junior standing.

### MGT 313 Industrial Relations (3)

Functions of personnel and labor relations as they relate to the management of the human resources in the organization. Industrial relations theory and practice. For nonbusiness majors only. 3 lectures. Prerequisite: Junior standing.

### MGT 314 Human Resources Management (4)

Personnel function as it relates to the management of the human resources of the organization. Survey of employee/employer relations, the work environment, employee development and labor relations. 4 lectures. Prerequisite: Junior standing.

**MGT 316 Labor Contract Negotiation and Administration (4)**

Collective bargaining and resolution of disputes between employees, unions, and employers. Simulation of bargaining and grievance processes. Contract development and arbitration. 4 lectures. Prerequisite: Junior standing.

**MGT 317 Organizational Behavior (4)**

Application of behavioral science concepts to management. Motivation, perception, communications, leadership style, group dynamics. Effectiveness: individual, interpersonal, team, intergroup and organizational. 4 lectures. Prerequisite: Junior standing.

**MGT 318 Modeling Systems (4)**

Model formulation and solution procedures. Structured and unstructured processes. Constructing models under uncertainty. Probabilistic processes in management planning. Tradeoffs in alternative courses of action. Deterministic and probabilistic models. Mathematical techniques in strategic planning. Game theory. Optimization and suboptimization in business models. 4 lectures. Prerequisite: Junior standing, STAT 252 or equivalent.

**MGT 321 Application of Information Processing and Quantitative Business Analysis (4)**

Application of computer and quantitative techniques in business and industry. Hardware, software concepts. File processing, data bases, management information systems. Description of quantitative methods in business. Relationships of the computer to the decision-making process. 4 lectures. Prerequisite: CSC 120, MATH 221, STAT 252 and junior standing.

**MGT 322 Management Information Systems (4)**

Characteristics of a management information system. Evaluation and justification for an information system. Data base and management information systems. Management decision-making process and decision support systems. 4 lectures. Prerequisite: MGT 321, MGT 325, or consent of instructor. CSC 345 is recommended.

**MGT 323 Simulation of Management Decision Making (4)**

Simulation of business problems for management decision making. Types of business simulators. Use of the computer in simulation. Interaction of the information system and the simulation concept. Business applications and solutions of cases. 4 lectures. Prerequisite: MGT 321 or consent of instructor.

**MGT 325 Production and Operations Management (4)**

Introduction to operations management and production systems; production models. Planning and control in manufacturing. Quantitative methods and statistical techniques used in production systems management. 4 lectures. Prerequisite: MGT 312, MGT 321 or concurrent enrollment.

**MGT 331 Organization Design and Analysis (4)**

Organizational design strategies and constructs, environmental, technological, and behavioral imperatives influencing organizational objectives and structures; design modifications to accommodate industrial, governmental, and nonprofit organizational requirements. Diagnostic analysis approaches; causation analysis; alternative formulation and analysis; design optimization criteria and techniques. 4 lectures. Prerequisite: MGT 312 or consent of instructor.

**MGT 332 International Business Management (4)**

Organization and operation of foreign business and multinational firms. Case studies dealing with differing cultural backgrounds, national interests, and economic pressures. 4 lectures. Prerequisite: MGT 312 and junior standing.

**MGT 341 Planning and Decision Theory (4)**

Development of a theory of planning. Process of planning, role of participants in planning, the auxiliary functions. Integration into a general theory of decision making, with behavioral and quantitative aspects. 4 lectures. Prerequisite: MGT 312, MGT 325, or consent of instructor.

**MGT 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing and consent of instructor.

**MGT 410 Compensation (4)**

Management of compensation systems. Wage, salary, and benefit administration. Job analysis, description, and evaluation. Incentive, insurance, leave, pensions, and sharing plans. Wage, hour, and benefit legislation. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

**MGT 413 Labor Law (4)**

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon labor, management, minorities, and the public. Current rules analyzed in a contemporary and historical context. Understanding important industrial relations and manpower problems. 4 lectures. Prerequisite: MGT 310 or consent of instructor.

**MGT 414 Business Strategy and Policy Seminar (4)**

Application of interdisciplinary skills to comprehensive short and long range strategy and policy formulation. Analysis of the interdependence between external environments and internal systems. Case studies from a general management point of view. Industry and company simulations. Group problem solving. Integrating course of the core curriculum. 4 seminars. Prerequisite: All 300-level Business core courses and senior standing.

**MGT 415 Advanced Personnel Management (4)**

Managerial functions related to the procurement, development, maintenance, and utilization of people in the work environment. 4 lectures. Prerequisite: MGT 314, or consent of instructor.

**MGT 417 Organization Development (4)**

Analysis of development and trends in the field of organization development. Application of behavioral science knowledge and social technology to growth and change of organizations for the purpose of improving effectiveness. Problem diagnosis and facilitation skills. 4 seminars. Prerequisite: MGT 317 or consent of instructor.

**MGT 418 Advanced Quantitative Methods and Controls in Business (3)**

Quantitative controls as applied to the operations of business. For the senior student who needs operational knowledge for application in business analysis and decision. 3 lectures. Prerequisite: MGT 318, MGT 325, and senior standing or consent of instructor.

**MGT 422 Information Systems Design and Implementation (4)**

Structured analysis and design for organizational information requirements. File and data base specifications. Distributed data base concepts. Input, output, and procedure controls. File security and cryptography. Hardware and software selection. Project management and control. Decision support systems. System implementation and audit. Management of data processing operations. 4 lectures. Prerequisite: MGT 322, MGT 323, CSC 446.



**MGT 430 Internship (2-8) (CR/NC)**

Business internship to permit student to correlate experience and academic knowledge. Placement in a part-time, supervised work experience program in a government agency or private organization (entrepreneurship, partnership or corporation) as approved by the department head. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. Sixteen hours of work experience per academic quarter per two units of credit. Maximum of eight units per quarter. Credit/No Credit grading only. Prerequisite: Junior standing.

**MGT 445 Advanced Operations Management (4)**

Advanced principles in operations management as applied to both manufacturing and service organizations. Topics include: product-service conversion systems, capacity planning and utilization, aggregate planning, scheduling and control, inventory management, and operations subsystem coordination with the organization's strategy. 4 lectures. Prerequisite: MGT 318, MGT 322, MGT 325, and senior standing.

**MGT 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: MGT 461 for MGT 462.

**MGT 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**MGT 488 Small Business Management (4)**

Application of management knowledge and skills to the specific managerial problems involved in planning and operating the smaller company; growth strategies; the art of securing performance; changing the organization structure to match growth; recruiting and compensating new personnel. 4 seminars. Prerequisite: Senior standing.

**MGT 489 Analysis of International and Multinational Organizations (4)**

Integration of theoretical and applied managerial concepts, strategies, and organizational practices in: international and multinational organizations; administration of foreign operations; conflicts between domestic and international policies and practices; integration of cultural, technological, and organizational management imperatives in multinational and international operations. 4 lectures. Prerequisite: MGT 332 or consent of instructor.

**MGT 500 Independent Study (1-4)**

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Prerequisite: Formal petition with approval.

**MKTG—MARKETING****MKTG 204 Elements of Marketing (4)**

Overview of the marketing institutions and function of marketing in the economic, socio-cultural and political-legal environments. 4 lectures. Prerequisite: ECON 201 or ECON 221 or equivalent, or consent of instructor. Not acceptable for credit toward Business Administration degree.

**MKTG 301 Principles of Marketing (4)**

Basic course in marketing that examines marketing's role in society and management of the product, promotion, pricing and channel strategies of the firm. 4 lectures. Prerequisite: ECON 222, and junior class standing.

**MKTG 302 Marketing Information and Analysis (4)**

Analysis of target markets, estimating market potential, identifying secondary and primary information sources, and forecasting sales. 4 lectures. Prerequisite: MKTG 301 and all lower division course requirements.

**MKTG 303 Buyer Behavior (4)**

Applied study of behavior that affects marketing decisions in both consumer and industrial markets. 4 lectures. Prerequisite: MKTG 302.

**MKTG 304 Channels and Physical Distribution (4)**

Selection, evaluation and control of channels of distribution and management of physical distribution. 4 lectures. Prerequisite: MKTG 302.

**MKTG 305 Promotion Strategies (4)**

Designing the promotion strategies of the firm, including advertising, personal selling, sales promotion, publicity and public relations. Communications media available; their uses and limitations. 4 lectures. Prerequisite: MKTG 302.

**MKTG 401 International Marketing (4)**

Marketing activities necessary to direct the flow of a company's goods and services to customers in global markets. 4 lectures. Prerequisite: MKTG 302 and senior standing.

**MKTG 405 Sales Management (4)**

Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: MKTG 302 and senior standing.

**MKTG 406 Marketing Management (4)**

Policymaking and decisionmaking applications in the planning, organizing, operating, controlling and evaluating of individual products and brands. 4 lectures. Prerequisite: MKTG 302 or consent of instructor.

**MKTG 412 Marketing Law (3)**

Federal and state laws, cases and regulations applicable to marketing. Lectures will include analysis of legal cases in topics including anti-trust, deceptive practices, patents, copyrights and trademarks. 3 lectures. Prerequisite: Senior standing. Recommended: BUS 207 and BUS 404.

**MKTG 450 Direct Marketing (4)**

Direct response marketing including the use of mail, space advertising, radio and television media in marketing products and services to consumer and industrial markets. 4 seminars. Prerequisite: MKTG 302 and senior standing.

**MKTG 466 Marketing Problems Seminar (4)**

Application of modern methods to the exploration and analysis of current and potential marketing trends, opportunities, and problems. 4 seminars. Prerequisite: Senior standing, MKTG 406 or consent of instructor.

**MKTG 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## MSC—MILITARY SCIENCE

### MSC 111 Current Military Affairs (2)

Organization and functions of the Department of Defense. Issues related to U.S. military affairs: selective service, arms control, nuclear weapons and alliances. Purpose of ROTC; military customs; and the military as a profession. 2 lectures.

### MSC 112 Survival Training I (2) (CR/NC)

Techniques of survival in a wilderness environment. Major emphasis on acquiring, preparing and consuming plant and animal food and first aid procedures. Open to all students. Credit/No Credit grading. 1 lecture, 1 activity.

### MSC 113 Survival Training II (2) (CR/NC)

Techniques of survival in a wilderness environment. Major emphasis on survival swimming and mountaineering, including evacuation techniques, rappelling and use of ropes. Open to all students. Credit/No Credit grading. 1 lecture, 1 activity.

### MSC 114 Basic Rifle Marksmanship (1) (CR/NC)

Basic principles and techniques of rifle shooting, including rifle parts and operation, range and safety discipline and care of guns and ammunition. Rifle firing with .22 caliber rifles. Open to all students. Credit/No Credit grading. 1 activity.

### MSC 211 Orienteering (2)

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. 2 lectures.

### MSC 212 Basic Camp (1-7)

Same material as MSC 112, 114, 211, and 213. One to seven units of credit may be granted depending upon successful completion of training. Six weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. Camp graduates eligible to enroll in ROTC Advanced Program.

### MSC 213 Leadership Assessment (2) (CR/NC)

Overview of behavioral skills necessary for good leadership and an assessment center session in which the student participates in a series of exercises designed to simulate critical behaviors related to successful leadership and management. Credit/No Credit grading. 2 lectures.

### MSC 214 Advanced Rifle Marksmanship (1) (CR/NC)

Rifle marksmanship techniques and skill development. Types of competition and rules for small bore rifle matches. Open to all students. Credit/No Credit grading. 1 activity. Prerequisite: MSC 114 or consent of instructor.

### MSC 311 Leadership and Management (3)

Descriptive model of platoon leadership including personnel within a platoon and tasks of platoon leaders; major theories of leadership; instruction and practice in communication, human relations, organizational structure, power and influence, and management. 3 lectures.

### MSC 312 Basic Military Skills (2)

Planning and conducting meetings, conferences and formal briefings; preparing, conducting and evaluating military training; use of military communications equipment, drill and ceremony; conducting physical conditioning. 2 lectures.

### MSC 313 Tactical Military Operations (3)

Organization of the United States and Soviet land combat forces including tactical doctrine and equipment; organization of the modern battlefield; fundamentals of small unit tactics; planning, organizing and conducting small unit operations; fundamentals of land navigation. 3 lectures.

**MSC 411 Military Justice (2)**

Uniform code of military justice, including the court martial system, disciplinary measures, military crimes, search and seizure, apprehension and safeguarding evidence. Overview of the laws of war. 2 lectures.

**MSC 412 Military Professionalism and Ethics (3)**

Professional knowledge subjects including command and staff functions, personnel, training and logistics management, military correspondence and leadership counseling. Moral philosophy and values essential to the military profession. 3 lectures.

**MU—MUSIC****MU 100 Music Fundamentals—Applied (3)**

Traditional music notation: use of treble staff for pitch and rhythm, chord symbols and harmonization using principal triads, major and minor, and common seventh chords. 2 lectures, 1 activity.

**MU 101 Materials of Music—Theory I (3)****GEB C.2.**

Introduction to the elements of music and their use by composers and performers. Intended for students with little or no prior musical experience. Introduces notation of pitch and rhythm, scales, intervals and chords. Reference to musical examples from a variety of musical styles and periods. 3 lectures.

**MU 102 Ear-Training and Sight-Singing (1)**

Systematic development of skills in reading musical notation. Students taught to hear mentally what they see and to reproduce rhythm and pitch accurately through singing. 1 activity.

**MU 103 Rhythm Skills (1)**

Traditional music rhythmic notation through the use of the Tap Master rhythm system. This system involves the use of the Tap Master machine and a series of cassette tapes for individual instruction. 1 laboratory.

**MU 111 Beginning Piano (2)**

Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

**MU 112, 113 Class Piano (2) (2)**

Continuation of MU 111. Piano for students with the ability to play a simple Bach or Mozart Minuet. Prerequisite: MU 111 or equivalent. 1 lecture, 1 activity.

**MU 131 Guitar (1)**

Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Designed to meet the needs of the public school teacher. No previous experience necessary. 1 activity.

**MU 141 University Jazz Band (1)**

Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert (with a guest professional artist). 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 142 Studio Band (1)**

Open to qualified instrumentalists concurrently enrolled in a major instrumental ensemble. Rehearsal and public performance of jazz and jazz/rock music at athletic events, band concerts, and other campus and community events. 1 activity. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 144 Symphony Orchestra (1)**

Open to any college student whose technique is adequate. In addition to standard repertoire, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given additional opportunities to perform chamber music. 1 laboratory. Prerequisite: Consent of instructor. Total credit limited to 6 units.

**MU 147 Instrumental Ensembles (1)**

Open to qualified musicians. Rehearsal and public performances in trios, quartets, and quintets. 1 activity. Prerequisite: Permission of instructor. Total credit limited to 6 units.

**MU 151 Band (1)**

Study and public performance of music written for large wind band (woodwinds, brass, and percussion). Limited to those students who have had experience with band instruments. The band plays for many university functions, concerts, assemblies and athletic events, and makes at least one trip each year. Smaller groups are organized from the band for special functions. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 152 University Winds (1)**

Study and public performance of music written for small wind ensembles (woodwinds, brass and percussion) from the sixteenth century to the present. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 154 Cal Poly Men's Chorus (1)**

Study and performance of choral music composed for men's voices. The Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Women's Chorus. Tryouts in fall, some openings can be filled in first week of winter quarter. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 155 University Singers (1)**

Study and public performance of music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 157 Cal Poly Women's Chorus (1)**

Study and performance of choral music composed for women's voices. The Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Men's Chorus. Tryouts in fall, some openings can be filled in first week of winter quarter. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 158 Choral Jazz Ensemble (1)**

Open to qualified singers and instrumentalists. Rehearsal and public performance of choral jazz, pop, and Broadway hits. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 203 Theory II (3)**

Structure of tonality in music of Western civilizations, four-part writing of triads in root position and inverted, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones. 3 lectures. Prerequisite: MU 101 or consent of instructor.

**MU 204 Appreciation of Music (3)**

GEB C.2.

Introduction to the music of major composers from the Renaissance to the present day. Includes a consideration of the historical background as well as the styles and forms used in Western art music. 3 lectures.

**MU 209 Jazz Styles (3)**

GEB C.3.

Survey of jazz from the 1920's to the present; its historical background and development in the United States. Big bands, combos, and soloists. Extensive use of recordings and live presentations. 3 lectures.

**MU 211, 212, 213 Class Piano (1) (1) (1)**

Intermediate level piano techniques with emphasis on style, interpretation, sight-reading, basic performance practices, and the solution to general musical problems. The classes proceed progressively. Total credit in each course limited to 2 units. 1 activity. Prerequisite: One year of piano or equivalent.

**MU 231 Instruments—Theory and Performance (1)**

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity.

**MU 237 Voice—Theory and Performance (1)**

Fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Total credit limited to 3 units. 1 activity.

**MU 301 Music for Children (3)**

Development of basic music proficiency; singing, conducting, playing simple instruments, accompaniment, rhythmic activities. Assumes a knowledge of music fundamentals. 3 lectures. Prerequisite: MU 100.

**MU 303 Theory III (3)**

The dominant seventh chord, nondominant seventh chord, modulation, augmented sixth chord, and neopolitan sixth chord. 3 lectures. Prerequisite: MU 203 or consent of instructor.

**MU 304 Music Composition (3)**

Composition of vocal and instrumental music in the smaller forms. Emphasis on Twentieth Century compositional techniques. 3 lectures. Prerequisite: Theory II or consent of instructor. Repeatable to 9 units.

**MU 308 Conducting (2)**

Principles and techniques in conducting with experience in score reading. 2 lectures. Prerequisite: MU 101 or equivalent.

**MU 311, 312, 313 Class Piano (1) (1) (1)**

Designed for the advanced student able to play a Mozart or Beethoven sonata. Emphasis on general knowledge of piano literature, interpretation, style, and performance practices. Admission to the class by audition. Fall quarter emphasis, Baroque keyboard literature; winter quarter, Classic; spring quarter, Romantic and Contemporary. Total credit in each course limited to 2 units. 1 activity.

**MU 331 Instruments (1)**

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Continuation of MU 231. Total credit limited to 6 units. 1 activity.

**MU 337 Voice (1)**

Fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Continuation of MU 237. 1 activity. Total credit limited to 3 units. Prerequisite: One year of voice or equivalent.

**MU 341 University Jazz Band (1)**

Limited to those who have had two years of Jazz Band experience. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert (with a guest professional artist). 1 laboratory. Total credit limited to 6 units. Prerequisite: Two years of University Jazz Band participation.

**MU 342 Studio Band (1)**

Open to qualified instrumentalists concurrently enrolled in a major instrumental ensemble. Rehearsal and public performance of jazz and jazz/rock music at athletic events, band concerts, and other campus and community events. 1 activity. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 344 Symphony Orchestra (1)**

Open to any college student whose technique is adequate. In addition to standard repertory, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given the additional opportunities to perform chamber music. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of orchestra participation.

**MU 347 Instrumental Ensemble (1)**

Open to qualified musicians. Rehearsal and public performance in trios, quartets, quintets. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

**MU 351 Band (1)**

Study and public performance of music written for large wind band (woodwinds, brass and percussion). Limited to those students who have had two years of band. The band plays for many university functions, concerts, assemblies, and athletic events, and makes at least one trip each year. Smaller groups are organized from the band for special functions. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of band participation and consent of instructor.

**MU 352 University Winds (1)**

Study and public performance of music written for small wind ensemble (woodwinds, brass and percussion) from the sixteenth century to the present. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 354 Cal Poly Men's Chorus (1)**

Study and performance of choral music composed for men's voices. The Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Women's Chorus. Tryouts in fall, some openings can be filled in first week of winter quarter. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 355 University Singers (1)**

Study and public performance of chamber music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 357 Cal Poly Women's Chorus (1)**

Study and performance of choral music composed for women's voices. The Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Men's Chorus. Tryouts in fall, some openings can be filled in first week of winter quarter. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 358 Choral Jazz Ensemble (1)**

Open to qualified singers and instrumentalists. Rehearsal and public performance of choral jazz, pop, and Broadway hits. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 367 Vocal Ensemble (1)**

Open to qualified singers. Rehearsal and public performance of vocal music. 1 activity. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**MU 404, 405, 406 History of Music (3) (3) (3)**

All: GEB C.3.

Intensive study of a selected topic in music history each quarter through the use of readings, recordings, and scores. Prior completion of at least one quarter of music appreciation is recommended. Total credit limited to 6 units. 3 lectures.

## **NRM—NATURAL RESOURCES MANAGEMENT**

**NRM 101 Natural Resources of America (3)**

Integrated development, utilization and management of the nation's natural resources for the continuous benefit of man and the conservation of the resources. 3 lectures.

**NRM 112 Parks and Outdoor Recreation (3)**

Introduction to national, state, county, city and private park systems. History, philosophy, policy and principles of the formation, administration and functioning of recreational units at the park, district and regional levels. 3 lectures.

**NRM 120 Fisheries and Wildlife Management (3)**

Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

**NRM 140 Career Development and Planning in Natural Resources Management (1) (CR/NC)**

Analysis and development of career goals in natural resources. Acquainting students with potential career options and assisting them in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

**NRM 201 Lake Management (4)**

Practices and management of recreational lakes to provide maximum use, to reduce aquatic pests, to provide necessary water quality, and to attract or produce aquatic animals associated with hunting and fishing preserves, farm ponds, and ornamental and recreational waters. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**NRM 203 Resource Law Enforcement (3)**

Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife. Problems associated with implementation of resource laws examined. 3 lectures.

**NRM 207 Resource Survey (3)**

Dynamic exercise and field experience pertaining to natural resources measurements. Inventory methods of vegetation and wildlife sampling and questionnaire surveys. 2 lectures, 1 laboratory.



**NRM 221 Wildlife Techniques (3)**

Techniques for working with terrestrial wildlife. Field and lab procedures for habitat analysis, telemetry, marking, capture, determination of age and sex, and population analysis. 2 lectures, 1 laboratory. Prerequisite: NRM 120.

**NRM 302 Natural Resources Policy (3)**

Historical development and significance of natural resource policies. Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. 2 lectures, 1 laboratory. Prerequisite: NRM 112, NRM 120, FOR 201.

**NRM 304 Ecology of Resource Areas (4)**

Addresses resource ecology in the major ecosystems of North America, dynamics of energy flow and nutrient cycles at the community and ecosystem level, man's role as a principal factor of change in the resource of natural systems. 3 lectures, 1 laboratory. Prerequisite: One course in biological sciences or consent of instructor.

**NRM 310 Management of Outdoor Recreation Users (3)**

Examination of outdoor recreation user behavior through application of behavioral science principles and techniques. The use of behavioral information for the planning, management, and maintenance of outdoor recreation areas. 3 lectures. Prerequisite: NRM 112, PSY 201 or PSY 202.

**NRM 311 Environmental Interpretation (3)**

Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 2 lectures, 1 laboratory. Prerequisite: SPC 202.

**NRM 312 Wildland Recreation (3)**

Types of wildlands, legal framework, and philosophies of management, special problems, illustrated with case studies. Concepts of recreational carrying capacity, with application in managing wildlands. 3 lectures. Prerequisite: NRM 112.

**NRM 320 Fishery Resource Management (4)**

Management of recreational and commercial fisheries to produce sustained annual crops of fishes. Survey, inventory, and evaluation techniques used for the management of a fishery. Methods of manipulating fish populations and the aquatic habitat. 3 lectures, 1 laboratory. Prerequisite: NRM 304.

**NRM 325 Wildlife Habitat Management (4)**

Habitat design, development, and management on lands that support wildlife. Habitat development planning project required. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: NRM 304 or BIO 325.

**NRM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**NRM 401 Natural Resource Economics (3)**

Principles of optimum use of renewable and nonrenewable natural resources, set in a framework of historical resource concerns and real world resource markets. Key resource sectors treated in detail: forestry, fisheries, water resources and natural environments. 2 lectures, 1 laboratory. Prerequisite: ECON 211, NRM 302.

**NRM 403 Environmental Impact Analysis (3)**

Environmental impact assessment process. Attention will be given to the historical background, legislation and techniques currently in use in the preparation of environmental documents for natural resource management agencies. Selected aspects of environmental law and regulations as applied to public agencies. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

**NRM 405 Applied Resource Analysis (4)**

Evaluation of environmental responses to resource management programs; preparation, implementation, and coordination of environmental activities in terms of multiple-use management. Standard measurement criteria, and interpretation of measurements. 3 lectures, 1 laboratory. Prerequisite: NRM 403 or consent of instructor.

**NRM 406 Natural Resources Administration (4)**

Administration of private and public natural resource units, including planning, budgeting, organizing, directing, staffing and controlling the units. 3 lectures, 1 laboratory. Prerequisite: Senior standing.

**NRM 407 Environmental Law (3) (Also listed as CRP 407)**

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

**NRM 408 Water Resource Law and Policy (3) (Also listed as CRP 408)**

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

**NRM 409 Coastal Resource Management (4)**

Natural resource assessment, evaluation and management techniques and procedures in coastal environments (land and water), including overview and integration of the physical, biological, social, economic and political (current regulations and program structure) systems as they influence resource management decisions. 3 seminars, 1 laboratory. Prerequisite: NRM 405 or instructor approval. Field trips with lab are mandatory.

**NRM 410 Water Oriented Recreation (4)**

Practices of management of water oriented outdoor recreation on private and public waters. Consideration of shoreline development, water surface time and space zoning, and underwater development. 3 lectures, 1 laboratory. Some weekends labs necessary. Prerequisite: NRM 112, NRM 310.

**NRM 411 Advanced Environmental Interpretation (3)**

Implementation of interpretive programs for parks, forests and other wildlands; program planning, organization, and development. Planning and operation of interpretive visitor areas and facilities. 2 seminars, 1 laboratory. Prerequisite: NRM 311.

**NRM 412 Planning for Parks in Wildland Areas (4)**

Basic planning and design principles of selected outdoor recreation sites giving students ability to dialogue with landscape architects. Area layout, facility design, construction, and maintenance of structures, grounds, roads, and trails. 3 lectures, 1 laboratory. Prerequisite: NRM 112.

**NRM 417 Resource Recreation Planning (3)**

Development and analysis of resource recreation plans. Planning theory, types of plans, scheduling techniques, projecting supply and demand, application of models, and economic evaluations. Examples emphasize planning for parks and recreation. 2 lectures, 1 laboratory. Prerequisite: NRM 112.

**NRM 420 Culture of Fishes (4)**

Management of a production fish hatchery. Facility design, water supply, quality, and control; production regimen; and process methods for game, food, and bait fishes. 3 lectures, 1 laboratory. Prerequisite: NRM 320.

**NRM 426 Resource Population Dynamics (3)**

Growth, fluctuations, balance, and natural mechanisms for control of wild animal populations. 3 lectures. Prerequisite: NRM 304 or one course in ecology.

**NRM 427 Marsh Management (4)**

Land, plant, animal, and water management on wetlands to provide suitable habitat for wildlife. Emphasis on waterfowl: identification, behavior, nesting requirements, foods, and diseases. 3 lectures, 1 laboratory. Prerequisite: BOT 123, NRM 304, or one course in ecology.

**NRM 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**NRM 463 Undergraduate Seminar (2)**

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 2 seminars.

**NRM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**NRM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**NRM 502 Resource Conservation (3)**

Conservation developments for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

**NRM 521 Natural Resources Management for Educators (3) (Also listed as AGED 521)**

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to each component as they relate to the present perception of today's resource base, use demands and projected utilization. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**NRM 540 Water Resource Systems (3)**

Regional water resource systems with three components: (1) biophysical, (2) soc-eco-political including legal and (3) planning and management. Interface between and among components for synthesis for practical implementation in existing environments. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**NRM 570 Selected Topics in Natural Resources Management (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and consent of instructor.

## OH—ORNAMENTAL HORTICULTURE

**OH 100 Orientation to Ornamental Horticulture (1) (CR/NC)**

Understanding the depth and breadth of the ornamental horticulture industry, the department, and the University. Student and professional organizations. Required of all students in the major. Credit/No Credit grading. 1 lecture.

**OH 101 Principles of Landscape Design I (3)**

Introduction to basic drafting skills and standards used in landscape industry. Principles and elements of design as they relate to landscape design. Two- and three-dimensional design. 1 lecture, 2 laboratories.

**OH 125 Commercial Floral Design Practices (3)**

Theory, techniques, and skills currently practiced in the floral design industry. Construction of basic floral products for resale, cut flower processing, industry sales practices, merchandising and packaging. Miscellaneous course fee required—see Class Schedule. 1 lecture, 2 laboratories.

**OH 126 Ornamental Horticulture Construction (2)**

Construction and repair of projects, using materials and methods unique to ornamental horticulture. Design and construction of simple irrigation systems related to the broad horticulture field. 1 lecture, 1 laboratory. Prerequisite: AE 121.

**OH 131 Fundamentals of Ornamental Horticulture I (4)**

Career potentials in the field of ornamental horticulture. Overview of practices found in the nursery industry. Discussion of student enterprise projects and records. Commercial nursery operations and garden practices. 3 lectures, 1 laboratory.

**OH 132 Fundamentals of Ornamental Horticulture II (3)**

Introduction to basic equipment and techniques in floriculture and floral design. Effects of environment on plant growth and relationships to commercial applications. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 131.

**OH 133 Fundamentals of Ornamental Horticulture III (4)**

Introduction to commercial practices of plant propagation: seed, cuttings, grafting, layering, tissue culture. Discussion of the structures and environmental conditions utilized for plant propagation. 3 lectures, 1 laboratory. Prerequisite: OH 131, OH 132.

**OH 134 Landscape Maintenance (3)**

Maintenance of trees, shrubs, ground covers, cultural requirements, irrigation, pruning, fertilizing. Repair of irrigation systems, equipment. Landscape maintenance industry. 2 lectures, 1 laboratory. Prerequisite: OH 126 or consent of instructor.

**OH 145 Bonsai Culture (2)**

Philosophy, history, training, culture, production, and care of the Japanese Bonsai. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity.

**OH 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**OH 201 Principles of Landscape Design II (3)**

Basic principles and elements of landscape design related to the problem solving process, design theory and composition, introduction to the creative problem solving process as a means to developing a landscape design, functional and design uses of landscape materials, client and maintenance criteria and an expansion of drafting skills including perspective. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 126, completion of the OH fundamentals sequence and one plant ID course.

**OH 225 Floriculture Grades and Standards (3)**

Grades and standards for cut flowers, potted plants, and other ornamentals. Use of score cards in evaluating florist crops. 1 lecture, 2 laboratories. Prerequisite: OH 131.

**OH 230 Ornamental Gardening (3)**

GEB F.2.

For nonhorticulture majors. Information and recommendations for the home gardener. Methods of propagation, pruning, planting, soils, fertilizers, lawn planting and maintenance, pest and weed control, home landscaping, and identification and care of house plants. 2 lectures, 1 laboratory.

**OH 231, 232, 233 Plant Materials (4) (4) (4)**

Identification, habits of growth, cultural requirements, and use of ornamental woody and herbaceous plants used in the landscape of California. 3 lectures, 1 laboratory.

**OH 237, 238, 239 Landscape Plants I, II, III (3) (3) (3)**

Woody and herbaceous plants used in California landscaping. Identification, landscape uses, cultural requirements and growth habits of those plants best shown during the fall, winter, and spring. For nonhorticulture majors. Field trips required. 2 lectures, 1 laboratory.

**OH 240 Principles of Greenhouse Environment (4)**

Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. 3 lectures, 1 laboratory. Prerequisite: OH 131 and OH 132, or consent of instructor.

**OH 243 Turf Management (4)**

Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory.

**OH 251 Ikebana (3)**

Techniques of the ancient art of Ikebana as it influences western floral design. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 132.

**OH 252 Continental Mass Design (3)**

History, theory and application of techniques of mass flower arranging. Study of traditional influences on commercial floral design practices in Continental Europe and North America. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

**OH 253 Stylized Western Design (3)**

Techniques of western stylized line design as it is known currently. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory. Prerequisite: OH 132.

**OH 302 Ornamental Horticulture Sales and Service (3)**

Historical establishment of the retail horticulture centers. Relating basic marketing and management principles to the unique conditions found in typical ornamental horticulture sales and service establishments. 2 lectures, 1 activity. Prerequisite: OH 125, OH 132, BUS 201, MKTG 204.

**OH 320 Landscape Media (3)**

Various media essential to present designs in the landscape industry. Basic techniques of design presentation involving plan, elevation, section and detail drawings, perspective, model construction and photography. Required field trip. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 201.

**OH 321 Residential Landscaping (4)**

Principles of landscape design for residential properties. Designing of several small home properties. 2 lectures, 2 laboratories. Prerequisite: OH 102, and two Plant Materials courses.

**OH 322 Advanced Landscape Design (4)**

Practical application of landscape design for small scale public or commercial spaces. Realistic design projects: site and user analysis, interior plantscape design, parking, circulation, design materials, street furniture and plant composition. Field trip required. 2 lectures, 2 laboratories. Prerequisite: OH 321.

**OH 324 Tropical Plant Culture (4)**

Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior plantscaping. 3 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**OH 327 Diseases and Pests of Ornamental Plants (4)**

Diseases and pests of ornamental plants, their effect on plants, their prevention and control. 3 lectures, 1 laboratory. Prerequisite: ENT 220 or CRSC 311, BOT 324.

**OH 328 Advanced Floral Design (4)**

Advanced styling of floral designs used in sympathy work; casket sprays, wreaths, hospital arrangements, and solid work. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: OH 132.

**OH 329 Advanced Floral Design (4)**

Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: OH 328.

**OH 330 Art of Flower Arrangement (3)**

Theory and practice of use of plant materials as art medium in creating floral design. Application of universal art principles to flower and foliage decorations. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

**OH 331 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 126, OH 201.

**OH 332 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 201, OH 331.

**OH 333 Advanced Turf Management (4)**

Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: OH 243.

**OH 337 Park Planning and Management (4)**

Design, management and maintenance of private and public parks and recreational areas. 3 lectures, 1 laboratory. Prerequisite: OH 126 and consent of instructor.

**OH 338 Advanced Plant Propagation (4)**

Current propagation practices with emphasis on producing and scheduling the early nursery phases of woody ornamental crops. Includes seed harvesting, handling and treatments; cutting production; and grafting/budding techniques. 3 lectures, 1 laboratory.

**OH 341 Cut Flower Production (4)**

Production of cut flowers and foliage in the field, under cloth and under glass. Preparation of cut flowers and foliage for market. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 240, SS 221 and consent of instructor.

**OH 342 Pot Plant Production (4)**

Production of major commercial potted plants under glass and lath. Preparation for sale and merchandising of greenhouse crops. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 341 and consent of instructor.

**OH 381 Advanced Plant Materials (3)**

Recognition, identification, ecological significance, propagation, uses and landscape potential, environmental impact, and cultural needs of California flora as they pertain to the horticultural field, and natural resource management. 2 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**OH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**OH 401 Field Studies in Ornamental Horticulture (1)**

Field trip to ornamental horticulture outlets and the industry businesses that supply them. Garden centers, flower shops and garden center flower shop combinations. Foundation and display gardens with retail outlets and public educational facilities. Required field trip includes wholesalers, jobbers, display houses, advertising agency and others working with the retailers. 1 activity.

**OH 402 Advanced Ornamental Horticulture Sales and Services (4)**

Legal aspects and economics of operating a commercial nursery and garden center. State and county regulations, quarantines, grades and standards of nursery stock and floral design materials. Purchasing, merchandising and record keeping. Trade associations and cooperative buying. 3 lectures, 1 laboratory. Field trip required. Prerequisite: ECON 201 or ECON 211, MGT 201, junior standing, or consent of instructor.

**OH 410 Weed Control in Ornamental Plants (4)**

Weed impact and control in ornamental plants including weed identification and biology, control strategies and characteristics and use of herbicides. 3 lectures, 1 laboratory. Prerequisite: OH 133 or consent of instructor.

**OH 421 Arboriculture (4)**

Care and management of large ornamental trees. Use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 231, OH 232, OH 233.

**OH 424 Wholesale Nursery Management (4)**

Commercial nursery operations including container plant handling, growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control and marketing. History and overview of the nursery industry. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221, senior standing, or consent of instructor.

**OH 425 Tissue Culture Propagation (2)**

Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. Miscellaneous course fee required—see Class Schedule. 1 lecture, 1 activity. Prerequisite: Junior standing and consent of instructor.

**OH 426 Systematic Plant Problem Solving (2)**

Diagnosing plant disorders through systematic inquiry process. Oral examinations require students not only to identify plant disorders but effectively to determine how the problem evolved. 1 lecture, 1 laboratory. Prerequisite: Senior standing, OH 327 and consent of instructor.

**OH 434 Landscape Management (3)**

Maintenance procedures and operations. Estimating scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 134 or permission of instructor.

**OH 443 Greenhouse Management (4)**

Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, cost accounting for floricultural crops, management decisions in production costs and personnel matters. Field trips required. 3 lectures, 1 laboratory. Prerequisite: OH 342 or consent of instructor.

**OH 454 Ornamental Horticulture Irrigation Systems (4)**

Irrigation system design with emphasis on landscape, nursery and specialized systems, materials and installation. 2 lectures, 2 laboratories. Prerequisites: OH 101, OH 201, AE 337 and senior standing.

**OH 460 Senior Seminar (1)**

Open forum for senior students presenting information and developing skills necessary for searching and career planning in professional horticulture. Exposure to current practices, procedures and developments in the OH industry. 1 seminar. Prerequisite: Completion of all lower division major courses and senior standing.

**OH 461 Senior Project (2)**

Selection of a project under faculty adviser approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in OH 462. Contract drawn up with approval of adviser. Minimum 60 hours. Prerequisite: All 100–200 level courses in OH curriculum; 135 units; ENGL 114, ENGL 218 taken concurrently.

**OH 462 Senior Project (2)**

Continuation of Senior Project development. Writeup of rough draft and formal draft of project. Completion of formal written report under adviser supervision. Minimum 60 hours. Prerequisite: OH 461 completed.

**OH 470 Selected Advanced Topics (1–3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**OH 471 Selected Advanced Laboratory (1–3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**OH 581 Graduate Seminar in Ornamental Horticulture (3)**

Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture. 3 seminars.

**PE—PHYSICAL EDUCATION****Number Fields for Physical Education Courses**

	Coed (PE)	Men (PEM)	Women (PEW)
General activities .....	100–165		
Intramural activities .....	174	175	176
Competitive athletics .....	181–199	181–199	181–199
Professional activities (PE majors or related option students only) .....	206–239		
Academic courses .....	240 up		



### General Activities

Enrollment is open to all students except for designated intramural courses. Courses carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in sports.

The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be repeated only once for credit.

Students not majoring in physical education may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree.

All general activity courses (PE 100-176) are evaluated on a Credit/No Credit basis. A miscellaneous course fee may be required—see Class Schedule.

### Coed

PE 100	Adaptive Activity	PE 132	Racquetball, Beg.
PE 101	Gymnastics	PE 133	Racquetball, Int.—Adv.
PE 103	Archery	PE 136	Skin-Scuba Diving
PE 104	Badminton, Beg.	PE 137	Self-Defense
PE 105	Badminton, Int.—Adv.	PE 139	Soccer, Beg.
PD 106	Ballet, Beg.	PE 140	Soccer, Int.—Adv.
PD 107	Ballet, Int.—Adv.	PD 141	Social Dance
PE 108	Basketball	PE 142	Softball
PE 109	Bowling	PE 143	Life Saving, Adv.
PE 110	Cycling	PE 144	Swimming, Beg.
PE 111	Fencing, Beg.	PE 145	Swimming, Int.
PE 112	Fencing, Int.—Adv.	PE 146	Swimming, Adv.
PE 116	Figure Control	PE 148	Tennis, Beg.
PD 118	Folk Dance	PE 149	Tennis, Int.—Adv.
PE 119	Handball, Beg.	PE 150	Tumbling-Vaulting
PE 121	Golf, Beg.	PE 151	Volleyball, Beg.
PE 122	Golf, Int.—Adv.	PE 152	Volleyball, Int.—Adv.
PD 123	Jazz Dance, Beg.	PE 154	Weight Training
PD 124	Jazz Dance, Int.—Adv.	PE 156	Aqua-Calisthenics
PE 125	Jogging	PE 158	Synch. Swimming
PE 126	Judo	PE 159	Wrestling
PD 127	Modern Dance, Beg.	PD 160	Social Dance, Int.
PD 128	Modern Dance, Int.—Adv.	PE 174	Coed Intramurals
PE 129	Hatha Yoga	PEM 175	Men's Intramurals
PE 131	Physical Conditioning	PEW 176	Women's Intramurals

### Competitive Athletics

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

Men		Women	
PEM 182	Baseball	PEM 183	Basketball
PEM 183	Basketball	PEW 184	Cross Country
PEM 184	Cross Country	PEW 184	Cross Country
PEM 185	Football	PEW 187	Gymnastics

PEM 189 Soccer  
 PEM 191 Swimming  
 PEM 192 Tennis  
 PEM 193 Track and  
 Field  
 PEM 196 Wrestling

PEW 190 Softball  
 PEW 191 Swimming  
 PEW 192 Tennis  
 PEW 193 Track and  
 Field  
 PEW 194 Volleyball

### Professional Activities

Enrollment limited to those pursuing a major in the Physical Education Department. Physical Education majors may apply a maximum of 24 units of credit earned in PE 101-239 toward the bachelor's degree. Course selection is determined by the student's adviser and on the basis of activity proficiency. All courses are one or two units and meet for two or four hours per week. All professional activities are coed and are designed to develop skills, knowledge of rules, strategy and analysis. Students are expected to reach at least an intermediate skill level upon completion of this series. Prerequisites in the 101-165 series activities will be required for those students who cannot demonstrate minimum skill levels.

PE 206 Tumbling-Vaulting (2)	PE 217 Flag Football/Football (1)
PE 207 Apparatus (2)	PE 218 Aquatics (2)
PE 208 Golf (1)	PE 221 Combatives/Self Defense (1)
PE 210 Tennis (1)	PE 222 Archery (1)
PE 211 Softball-Baseball (1)	PE 223 Cross Country and Track Events (1)
PE 212 Handball/Racquetball (1)	PE 224 Field Events (1)
PE 213 Basketball (1)	PE 225 Team Handball (1)
PE 214 Volleyball (1)	PE 226 Field Hockey (1)
PE 215 Field Sports (Soccer, Speedball, Speed-away) (2)	PE 229 Badminton (1)
PE 216 Wrestling (1)	

### Academic Courses

Professional courses designed primarily for the student majoring in physical education. Course PE 250 may be used in partial satisfaction of the General Education-Breadth requirement in physical education.

PE 241 Fitness and Training: Scientific Basis (1)

Introduction to physiological principles and factors which provide the basis for the development and maintenance of optional physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 154 or PE 156.

PD 244 Introduction to Dance (3)

Dance fundamentals, movement, elements of music, rhythmic analysis and their relationship to dance. Introduction of all types of dance and brief history and philosophy. Limited to Physical Education and Recreation Administration majors. 1 lecture, 2 two-hour laboratories.

PE 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as REC 245)

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 two-hour laboratory.

PE 250 Health Education (2)

GE E.2.

Introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

PE 252 Beginning Athletic Training (2)

Modern principles and practices in the prevention, treatment, rehabilitation and follow-up care of athletic injuries. Functions and limitations of the athletic trainer as an athletic paramedic. Theory and practice of adhesive strapping as related to supporting major body joints for athletic participation. 2 two-hour activities. Prerequisite: ZOO 131.

**PE 254 School Health Program (2)**

Introduction to school health services, instruction, and environment within the public and private school system. 2 lectures.

**PE 270 Introduction to Physical Education (2)**

Designed to acquaint the student with the concept of physical education as a profession and to orient the student to the Cal Poly program. 2 lectures.

**PE 274 History and Philosophy of Physical Education (3)**

History of physical education including philosophical, institutional, and personal influences. Application of education principles to physical education. 3 lectures.

**PE 276 Human Element in Sport (3)**

Introduction of psychological and sociological concepts as they apply to play, games and sport. 3 lectures. Prerequisite: Consent of instructor for nonmajors.

**PE 278 Officiating Football (1)**

Rules interpretation and techniques of officiating football. 1 two-hour laboratory.

**PE 280 Safety and First Aid (2)**

Standard American Red Cross first aid course. Instruction and practice in the immediate and temporary care of injuries and sudden illness. 1 lecture, 1 two-hour laboratory.

**PE 284 Water Safety (1)**

Review of life saving skills, analysis of swim strokes and techniques, teaching experience. Upon successful course completion, students are eligible for examination for a Red Cross W.S.I. card. Curriculum requirements can be satisfied even though card requirements are not fulfilled. 2 one and one-half hour laboratories. Prerequisite: Current life saving card.

**PE 290 Officiating Basketball (1)**

Rules interpretation and officiating of men's and women's basketball. 1 two-hour laboratory.

**PE 294 Officiating Track and Field (1)**

Rules interpretation and officiating track and field events. 1 two-hour laboratory.

**PE 296 Planning Techniques in Physical Education (3)**

Practical skills and techniques of teaching physical education in schools. Unit and lesson planning and organizing, class management and procedure, teaching aids, evaluation skills. 2 lectures, 1 two-hour laboratory.

**PE 297 Officiating Volleyball (1)**

Rules interpretation and officiating of volleyball. 1 two-hour laboratory.

**PE 298 Officiating Baseball and Softball (1)**

Rule interpretations in officiating baseball and softball. 2 one-hour activities. Prerequisite: PE 211 or consent of instructor.

**PE 302 Mechanical Kinesiology (3)**

Fundamental biomechanical concepts and their application to sport and other human movement activities. 2 lectures, 1 two-hour laboratory. Prerequisite: ZOO 237 and ZOO 340.

**PE 303 Physiology of Exercise (3)**

Application of the knowledge of human physiology to exercise situations. 2 lectures, 1 two-hour laboratory. Prerequisite: ZOO 238, ZOO 239.

**PE 305 Drug Education (2)**

Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restricted dangerous drugs. 2 lectures.

**PE 312 Teaching and Coaching Swimming and Water Polo (3)**

Supervision of swimming pool activities. Teaching and coaching swimming and water polo. 2 lectures, 1 two-hour laboratory. Prerequisite: PE 218 or consent of instructor and PE 296.

**PE 319 Tests and Measurements in Physical Education (3)**

Physical tests and measurements of skill, strength, speed, and endurance as a basis for grading and as a measure of progress in activities. 2 lectures, 1 two-hour laboratory. Prerequisite: STAT 211, STAT 212.

**PE 321 Coaching Football (2)**

Fundamentals and systems of offensive and defensive football. Preparation for interscholastic coaching. Rules of the game. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 217 or consent of instructor.

**PE 322 Coaching Basketball (2)**

Theories of coaching, principles of organization of interscholastic basketball. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 213 or consent of instructor.

**PE 323 Baseball Coaching Theory and Practice (2)**

Fundamentals of baseball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 211 or consent of instructor.

**PE 325 Softball Coaching Theory and Practice (2)**

Fundamentals of softball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. Slow pitch as well as fast pitch techniques will be emphasized. 1 lecture, 1 two-hour laboratory.

**PE 327 Coaching Wrestling (2)**

Coaching techniques of wrestling. Theories of coaching principles and organization of interscholastic wrestling. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 216 or consent of instructor.

**PE 332 Elementary School Physical Education (3)**

Prepares the student to guide elementary school age children through a well-balanced program in physical education. Aims, objectives, procedures, methods, evaluation and program planning. 2 lectures, 1 two-hour laboratory.

**PE 344 Coaching Power Volleyball (2)**

Techniques and theories of individual fundamentals, game strategies, and problems of coaching secondary and collegiate level athletes. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 214 or consent of instructor.

**PE 356 Teaching and Coaching Gymnastics (3)**

Techniques and problems in teaching gymnastics. Practical experience in organizing interscholastic gymnastics. Theories of coaching principles and analysis of stunts. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 206, PE 207, or consent of instructor and PE 296.

**PE 375 Teaching Team and Individual Sports (3)**

Techniques in teaching team and individual sports. 1 lecture, 2 two-hour laboratories. Prerequisite: Two team and two individual professional activity courses or consent of instructor and PE 296.

**PE 379 Teaching Track and Field and Cross Country (3)**

Techniques and problems in teaching track and field and cross country. 2 lectures, 1 two-hour laboratory. Prerequisite: PE 223, PE 224, or consent of instructor and PE 296.

**PD 381 Recreational Dance Theory (3)**

Development of teaching techniques, methods, curricular materials and evaluation procedures as related to the teaching of folk, social and square dance. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 244, or consent of instructor and PE 296.

**PD 383 Modern Dance Theory (3)**

Development of teaching techniques, methods, curricular materials and evaluation procedures as related to the teaching of modern dance in the elementary and secondary schools. 1 lecture, 2 two-hour activities. Prerequisite: PE 127 or PE 128, PE 244 or consent of instructor and PE 296.

**PD 385 Choreography (3)**

Problems connected with dance composition and choreography. Practical experience in preparing dance productions. 1 seminar, 2 laboratories. Prerequisite: One year dance experience, by audition or consent of instructor.

**PD 386 Stage Dance Production (3)**

Stage dance production for public performances. Rehearsing, costuming, sets and props lighting. Total credit limited to 9 units. 1 seminar, a minimum of six hour per week in laboratory. Prerequisite: PE 385 or consent of instructor.

**PE 400 Special Problems for Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing or consent of instructor.

**PE 401 Organization and Administration of Health and Physical Education (3)**

Underlying philosophy, principles, policies, and procedures of administration as applied to health and physical education in various settings such as schools, dance studios, and public/private fitness clubs and programs. 3 lectures.

**PE 402 Introduction to Motor Learning (3)**

Analysis of psychological factors which affect motor skill acquisition. 3 lectures.

**PE 405 Administration of Health Education (2)**

Current procedures and policies in curriculum development and basic administration of health education programs. 2 lectures.

**PE 406 Adaptive Physical Education (3)**

Characteristics of special populations; how their physical education needs can be met through special and regular programs. 2 lectures, 1 two-hour laboratory. Prerequisite: PE 250.

**PE 407 Adapted Physical Education Program Development (3)**

Practical exploration of the development of individualized programs designed to meet the needs of the handicapped. Development of sports programs and physical conditioning for selected disabilities. 3 lectures. Prerequisite: PE 406.

**PE 410 Psychology of Coaching (3)**

Psychological consideration of the coach-athlete relationship. Mental preparation of teams and individuals for competition. 3 lectures. Prerequisite: Senior standing.

**PE 416 Physical Education/Recreation Facilities (3) (Also listed as REC 416)**

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance and equipment as related to physical education and recreation areas and facilities. Field visits required. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

**PE 424 Organizing and Teaching Physical Education (3)**

Organization, selection, presentation, application, and interpretation of subject matter in physical education. 3 lectures. Prerequisite: Consent of instructor.

**PE 432 Athletic Training and Rehabilitation (2)**

Modern principles and practices in conditioning and care of athletes. Theory and practice in the scientific manipulation of the muscles as related to therapeutic exercise. 2 two-hour laboratories. Prerequisite: PE 252.

**PE 434 Foundations for Development of Conditioning Programs (2)**

Application of scientific principles and rationale for the development of physical conditioning programs for assorted populations, including the normal child and adult, the handicapped, the middle-aged, the elderly and the highly competitive male or female athlete. Investigation of current theories, philosophies and practices of strength, endurance and flexibility development. 2 lectures. Prerequisite: PE 252, PE 302, PE 303.

**PE 437 Directed Field Work (1-3)**

Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of adviser.

**PE 438 Adaptive Physical Education Field Work (1-3)**

Practical work experience in adaptive physical education under qualified supervision. Students required to work with elementary school, secondary school and postsecondary age people. Total credit limited to 6 units. Prerequisite: Consent of instructor one quarter prior to enrollment; PE 406, PE 407.

**PE 440 Physical Education Practicum (1)**

Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular option or certificate program. Total credit limited to 3 units, 2 hours per week. Prerequisite: Consent of instructor.

**PE 445 Principles of Electrocardiography and EKG Interpretation (3)**

Basic principles of electrocardiography, emphasizing a knowledge of resting and exercise EKG monitoring procedures, interpretation skills of normal and abnormal heart function including vector abnormalities of myocardial infarction, arrhythmias and conduction irregularities, and an understanding of the primary cardiac drugs. 2 lectures, 1 laboratory. Prerequisite: ZOO 237, ZOO 238, ZOO 239, CHEM 328, PE 303 or consent of instructor.

**PE 450 Lifestyle Management in a Physical Fitness Setting (3)**

Designed to acquaint students with those events, situations and relationships leading to healthy lifestyles in fitness and occupational settings. Emphasis on stress and time management, exercise, nutrition and relaxation techniques. 2 lectures, 1 laboratory. Prerequisite: Senior standing; nonmajors: consent of instructor.

**PE 451 Nutrition for Fitness and Sport (3)**

Application of nutritional facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutrition supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures. Prerequisite: HE 210 and PE 303.

**PE 452 Testing and Exercise Prescription for Fitness Specialists (3)**

Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 1 seminar, 2 laboratories. Prerequisite: HE 210, PE 303, PE 445 or consent of instructor.

**PE 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: PE 302, PE 303, PE 319, ENGL 300 or adviser approval.

**PE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

**PE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**PE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

**PE 501 Administration of Adapted Physical Education Programs (3)**

Principles, policies, and procedures of administration as applied to the adaptive physical education program for the elementary and secondary school levels. Legal aspects involving city, county, state and national agencies. Assessment of program effectiveness. 3 seminars. Prerequisites: PE 406, PE 407.

**PE 502 Seminar in Problems of Physical Education (3)**

Practical problems in physical education and their solution in terms of desired objectives in this field. 3 seminars.

**PE 511 Administration of Physical Education (3)**

Principles and techniques of administration of physical education on the elementary and secondary school levels. 3 seminars.

**PE 512 Critical Health Issues (3)**

Contemporary health issues and related information. Adaptability of scientific health discoveries to current patterns of living. 3 seminars.

**PE 513 Evaluation of Current Studies (3)**

Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: PE 517.

**PE 517 Research Methods in Physical Education (3)**

Experimental, descriptive, historical, philosophical, and action research in physical education. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: PE 319 or consent of instructor.

**PE 522 Biomechanics (3)**

Advanced biomechanical concepts and their application to human movement. Examination of current literature. 3 seminars. Prerequisite: PE 302, PE 303, consent of instructor.

**PE 525 Human Performance and Learning (3)**

Analysis of research principles and concepts and variables related to human motor performance and learning with emphasis on the information processing approach for evaluating performance. 3 seminars.

**PE 526 Sport in American Society (3)**

Understanding the role of sport in American society as viewed from sociological and psychological perspectives. Effect of success and failure in competitive sport situations. 3 seminars.

**PE 530 Advanced Physiology of Exercise (3)**

Effects of exercise on human beings in relation to performance and physiological adjustment to activity. 3 seminars. Prerequisite: PE 303.

## 472 PHIL

### PE 535 Administration of Athletics (3)

Responsibilities and administrative concerns of athletic directors. Philosophy and ethics, budget and finance, equipment and supplies, legal liability, public relations, planning and maintenance of facilities, health aspects of athletics, and responsibilities to students. 3 seminars.

### PE 581 Graduate Seminar in Physical Education (1-3)

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars. Prerequisite: Graduate standing or consent of instructor.

### PE 599 Thesis (3) (3)

Independent research under the guidance and supervision of the staff. Prerequisite: PE 517, consent of graduate adviser and supervising faculty member.

## PHIL—PHILOSOPHY

### PHIL 125 Critical Thinking (3) (Also listed as ENGL 125 and SPC 125)

GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

### PHIL 220 Logic (4)

In-depth survey of informal and formal logic covering informal fallacies, language and definition, categorical syllogisms, modern logic and inductive reasoning. 4 lectures.

### PHIL 230 Philosophical Classics (3)

GEB C.1.

Readings of various philosophic classics with focus on the identification and evaluation of the central metaphysical epistemological themes. Various major arguments through a case mode presentation. 3 lectures.

### PHIL 231 Philosophical Classics (3)

GEB C.1.

Readings with focus on the identification and evaluation of the central themes of ethics, social and political philosophy. Various major arguments through a case mode presentation. 3 lectures.

### PHIL 305 Judeo-Christian Religions (3)

GEB C.3.

Origins, beliefs, practices and philosophies of Judaism and Christianity, and of the ancient Middle Eastern Religions which led to their development. Influence of these religions on the West and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### PHIL 306 Asian Religions (3)

GEB C.3.

Origins, beliefs, practices and philosophies of the religions of the Hindus, Buddhists, Taoists, Confucianists and Shintoists and other faiths common to India and the Far East. Influence of these religions on the world and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### PHIL 307 Philosophy of Religion (3)

GEB C.3.

Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### PHIL 308 Islamic Religions (3)

GEB C.3.

Beliefs, ethics and religious practices of Islam. Historical development of the Islamic tradition. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

### PHIL 311 History of Greek Philosophy (3)

GEB C.3.

Beginnings of Western science and philosophy. Pre-Socrates, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.



## PHIL 312 History of Medieval Philosophy (3)

GEB C.3.

Developments of Western philosophy from Augustine to Ockham, especially the philosophies of Anselm, Abelard, Roger Bacon, Bonaventure, and Aquinas. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 313 History of Modern Philosophy (3)

GEB C.3.

Development of Western philosophy from the Renaissance period through Hume with emphasis upon the philosophies of the Continental Rationalists and the British Empiricists. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 314 19th and 20th Century European Philosophy (3)

GEB C.3.

Primary issues and concepts found in Hegel's thought and its Continental descendants through existentialism. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 315 Contemporary Philosophy (3)

GEB C.3.

Contemporary answers to perennial philosophical questions regarding man, the universe, and their relationships. Representative examples from the major contributors to the new movements in philosophy: Existentialism, Phenomenology, Logical Positivism, Analytic Philosophy, and Pragmatism. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 321 Philosophy of Science (3)

GEB C.3.

Methods of physics, biology, psychology and other selected sciences, with reference to their presuppositions and general findings. Relations between the sciences and implications of scientific methods for other fields of inquiry. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 322 Symbolic Logic (3)

Introduction to the techniques of formal reasoning. Propositional and predicate logic, predicate logic with identity and definite descriptions. Metalogical foundations of modern symbolic logic. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 331 Ethics (3)

GEB C.3.

Inquiry into the problems of the principles of right action and justice, of moral character and motivation, and of the good life. Examination of traditional and contemporary answers to these problems and the implications of those answers. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 333 Political Philosophy (3)

GEB C.3.

Philosophic foundation of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 335 Social Ethics (3)

GEB C.3.

Ethical theory and critical analysis applied to the resolution of public policy about children's rights, family law, racial and sexual discrimination, government regulation of business, technology and ecology. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 337 Professional Ethics (3)

GEB C.3.

Critical examination of ethical problems arising in the professions. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHIL 341 Philosophy of Art (3)

GEB C.3.

Theories about the nature and evaluation of artistic and literary phenomena. Relationship of art and literature to ethics, metaphysics, religion, political philosophy and epistemology. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHYS—PHYSICS

## PHYS 100 Introduction to Physics (1) (CR/NC)

Introduction to the professional work of the physicist. Content and methods of physics. Orientation to the resources and objectives of the Physics Department. Offered only on a Credit/No Credit basis. Open to physics and physical science majors only. 1 lecture.

## PHYS 104 Introductory Physics (4)

GEB B.1.a.

Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken a college course in physics. 4 lectures. Prerequisite: MATH 103, MATH 114 or MATH 120.

## PHYS 121 College Physics (4)

GEB B.1.a.

An introductory course in mechanics emphasizing motion, force, and energy. Not open for credit to students having a grade of C or better in PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 115 or MATH 120.

## PHYS 122 College Physics (4)

GEB B.1.a.

Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C or better in PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

## PHYS 123 College Physics (4)

GEB B.1.a.

Continuation of PHYS 121 and 122. Topics include electrostatics, electric current, magnetic fields and induction, elements of modern physics. Not open for credit to students having a grade of C or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

## PHYS 131 General Physics (4)

GEB B.1.a.

Fundamental principles of mechanics: vectors, particle kinematics, statics and dynamics, equilibrium of a rigid body, work and energy, linear momentum. Primarily for physical science, engineering, and architecture students. 3 lectures, 1 laboratory. Prerequisite: MATH 131 or concurrent enrollment in MATH 142; high school physics recommended.

## PHYS 132 General Physics (4)

GEB B.1.a.

Rotational kinematics and dynamics, oscillations, waves in elastic media, sound waves, temperature, heat and the first law of thermodynamics, kinetic theory of matter, second law of thermodynamics. 3 lectures, 1 laboratory. Prerequisite: PHYS 131.

## PHYS 133 General Physics (4)

GEB B.1.a.

Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf, geometric and wave properties of light. 3 lectures, 1 laboratory. Prerequisite: PHYS 131, MATH 132 or MATH 142.

## PHYS 134 General Physics (3)

Magnetic properties of matter, circuits, Maxwell's equations, electromagnetic waves, radiation, special relativity. 3 lectures. Prerequisite: PHYS 133 or EL 207.

## PHYS 137 General Physics: Applied Physics for Architects (4)

Applied physics problems related to architecture including: damped, forced, and coupled oscillations in mechanical structures and electric circuits; earthquakes and structures; elementary electric circuit and wiring concepts; energy transport and efficient use of energy in buildings. For School of Architecture and Environmental Design majors. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, MATH 142.

## PHYS 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**PHYS 202 Physics and the Computer (2)****GEB B.1.a.**

Microcomputers used to solve a variety of physics problems in the areas of optics, thermodynamics, mechanics, electricity and magnetism, astrophysics, and modern physics. 2 lectures. Prerequisite: PHYS 133, CSC 101 or CSC 110 or equivalent.

**PHYS 206, 207 Instrumentation in Experimental Physics (2) (2)**

Electrical and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 2 lectures. Prerequisite: MATH 143, course in the use of Pascal or Fortran programming language, prerequisite or concurrent PHYS 134 and concurrent enrollment in PHYS 256, PHYS 257.

**PHYS 210 Introduction to Modern Physics (4)****GEB B.1.a.**

Fundamental principles of modern physics, emphasizing atomic and nuclear phenomena. Introduction to special relativity, wave particle duality, Bohr theory, radioactivity, interaction of radiation with matter, and nuclear reactions. 4 lectures. Prerequisite: PHYS 133 or EL 207 or PHYS 123 and MATH 132. Not open to students who have taken PHYS 211.

**PHYS 211 Modern Physics (4)****GEB B.1.a.**

Fundamental principles of physical optics and quantum mechanics, emphasizing the modern description of atomic phenomena. Introduction to physical optics, kinetic theory, wave particle duality, Bohr theory, Schrodinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, MATH 133 or MATH 241.

**PHYS 213 Introduction to Nuclear Physics (3)****GEB B.1.a.**

Nuclear radiations and interactions. Detection methods, instruments and radioactive hazards. Nuclear reactions and induced radioactivity. Nuclear energy. 3 lectures. Prerequisite: PHYS 211.

**PHYS 215 Physics of Sound and Music (3)****GEB B.1.a.**

Wave nature of sound; musical instruments and production of sound, overtones and tone quality, musical scales; decibels and noise hazards; speech and hearing; recording and reproduction of sound; electronic instruments and synthesizers; room acoustics. 3 lectures. Prerequisite: Any PHYS or PSC course that deals with waves and sound.

**PHYS 243 Introductory Nuclear Physics Laboratory (1)****GEB B.1.a.**

Techniques of nuclear radiation detection and measurement including Geiger, proportional and scintillation counting. Properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: PHYS 210 or PHYS 213, PHYS 256 or equivalent.

**PHYS 256, 257 Electrical Measurements Laboratory (1) (1)**

Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: PHYS 133, MATH 143, and concurrently PHYS 206, PHYS 207.

**PHYS 301 Statistical Physics and Heat (3)****GEB B.1.a.**

Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: PHYS 132, PHYS 210 or PHYS 211, MATH 241.

**PHYS 302 Analytic Mechanics (3)****GEB B.1.a.**

Vector analysis, laws of motion, kinematics and dynamics of a particle. Work and energy. Oscillatory motion (damped and forced oscillation). Center of mass. Linear and angular momentum. 3 lectures. Prerequisite: PHYS 131, MATH 242.

**PHYS 303 Analytic Mechanics (3)**

Dynamics of a rigid body. Three-dimensional motion of a rigid body, introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: PHYS 302, concurrent MATH 304.

**PHYS 310 Physics of Energy (3)****GEB B.1.a.**

Physics and mathematics applied to broad energy topics. Conservation, transportation, solar energy, nuclear fission, breeder reactors, plasma fusion, laser fusion and separation, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy, transmission, storage, fossils, magnetohydrodynamic generators, and national planning. 3 lectures. Prerequisite: PHYS 133.

**PHYS 313 Introduction to Atmospheric Physics (3)****GEB B.1.a.**

Properties of the atmosphere. Atmospheric motions. Solar and terrestrial radiation; atmospheric scattering, optics, elements of radiative heat transfer and cloud physics. Description of the upper atmosphere. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 143 or MATH 133 or equivalent.

**PHYS 315 Introduction to Lasers and Laser Applications (3)****GEB B.1.a.**

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, or PHYS 123 with MATH 133 or MATH 143.

**PHYS 317 Special Theory of Relativity (3)****GEB B.1.a.**

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four- Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 210 or PHYS 211.

**PHYS 323 Physical Optics (4)****GEB B.1.a.**

Survey of geometrical optics. Interference, Fraunhofer diffraction, Fresnel diffraction, polarization. Selected topics in modern optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 134, PHYS 210 or PHYS 211, MATH 241, or consent of instructor.

**PHYS 341, 342 Quantum Physics Laboratory (1) (2)****GEB B.1.a.**

Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory, 2 laboratories. Prerequisite: PHYS 243.

**PHYS 363 Undergraduate Seminar (2)**

Study and oral presentation of current developments in physics. Discussion of projects and research by students and faculty. 2 seminars.

**PHYS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**PHYS 403 Nuclear Physics (3)****GEB B.1.a.**

Nuclear reactions. Structure of the nucleus. Nuclear energy levels. Radioactive decay processes. Nuclear fission. Nuclear spin and magnetic moment. Elementary particles. 3 lectures. Prerequisite: PHYS 213, PHYS 405.

**PHYS 405 Quantum Mechanics (3)**

Wave nature of matter. Wave function and its interpretation. The Schroedinger equation. Solutions for one dimensional problems and the one electron atom. 3 lectures. Prerequisite: PHYS 211; MATH 242. Recommend: MATH 304.

**PHYS 406 Solid State Physics (3)**

Crystalline structure of solids. Vibrational and electronic energies in the crystal lattice. Electrical, thermal, and magnetic properties of metals, insulators, and semiconductors. 3 lectures. Prerequisite: PHYS 405.

**PHYS 407 Quantum Mechanics (3)**

Electron spin and Pauli spin matrices. Matrix mechanics. Total angular momentum. Perturbation theory. Radiative transitions. Identical particles. 3 lectures. Prerequisite: PHYS 405.

**PHYS 408, 409 Electromagnetic Fields and Waves (4) (3)**

Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf's, magnetic materials, Maxwell's equations, wave equations, plane electromagnetic waves. Dipole radiation, radiation from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: PHYS 134, MATH 304.

**PHYS 410 Physics of the Solid Earth (3)**

GEB B.1.a.

Gravity and the figure of the earth. Body wave seismology, structure and composition of the earth, heat flow and heat sources, earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism. 3 lectures. Prerequisite: PHYS 133 and MATH 242 or equivalent.

**PHYS 412 Solid State Physics for Engineers (3)**

GEB B.1.a.

Basic quantum mechanics. Application to atomic structure and bonding. Crystal structures and their determination. Elementary treatments of Fermi statistics, free electron theory and band theory of solids, bulk properties of metals and semiconductors. Application to optical properties of solids and to selected current topics of interest (lasers, superconductivity, etc.). 3 lectures. Prerequisite: PHYS 211.

**PHYS 413 Advanced Topics in Solid State Physics (3)**

Lattice dynamics, tunable lasers, nonlinear optics, band theory, transport phenomena. Properties of superfluids and conductors, current experimental techniques. Review of the present state of the art from journal articles. 3 lectures. Prerequisite: PHYS 406, PHYS 412, or consent of instructor.

**PHYS 416 Theoretical Acoustics (3)**

Mathematics-based theoretical treatment of vibrations and normal modes; wave equation and solutions; radiation from vibrating sources, resonators and filters; impedance; decibel scale; speech, hearing and psychological acoustics. 3 lectures. Prerequisite: PHYS 132 and MATH 318.

**PHYS 421 Nuclear Reactor Physics (4)**

GEB B.1.a.

Nuclear fission. Nuclear chain reaction. Neutron diffusion. Thermal reactor critical equation. Time varying system. Reactor control and factors affecting multiplication. 3 lectures, 1 laboratory. Prerequisite: PHYS 243, MATH 242.

**PHYS 452 Solid State Physics Laboratory for Engineers (1)**

Selected experiments on the solid state of matter using electrical, optical, and x-ray methods. 1 laboratory. Prerequisite or concurrent: PHYS 412.

**PHYS 456 Solid State Physics Laboratory (1)**

Experimental study of the solid state of matter using X-ray, electrical and optical methods. 1 laboratory. Prerequisite or concurrent: PHYS 406. Prerequisite: PHYS 341 or consent of instructor.

**PHYS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**PHYS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**PHYS 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

## PI—POULTRY

### PI 121 Poultry Industry Development (4)

GEB F.2.

Scope and importance of the poultry industry as a part of California agriculture. Poultry organizations, publications, employment opportunities. Basic skills in industry organization. 3 lectures, 1 laboratory.

### PI 122 Replacement Programs and Broiler Production (4)

Organization and planning of the replacement program on the commercial poultry enterprise. Modern techniques and practices including costs, facilities, and management of replacement programs and broiler production. 3 lectures, 1 laboratory.

### PI 133 Poultry Incubation (3)

Embryology fundamentals and metabolism of the developing embryo. Artificial incubation practices as applied in the commercial hatchery. Nutritional, genetic and environmental factors that affect the hatch. 2 lectures, 1 laboratory.

### PI 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### PI 221 Poultry Selection and Egg Production (3)

Biological environmental factors that affect quality, size, and number of eggs produced. Techniques and practices of working with the commercial producing flock. 2 lectures, 1 laboratory.

### PI 222 Poultry Products, Processing and Marketing (3)

GEB F.2.

Assembling, processing, distributing and merchandising of poultry meat and eggs. Standardization and regulations applicable to the marketing of poultry products. Development and promotion of consumer products. 2 lectures, 1 laboratory.

### PI 230 General Poultry Production (3)

GEB F.2.

Survey of the various phases of the modern poultry industry including nutrition, breeding, flock health, production and management. Business aspects of poultry production and marketing of products. Not open to poultry majors. 2 lectures, 1 laboratory.

### PI 231 Poultry Anatomy and Physiology (3)

Structural aspects and normal functions of the principal systems of domestic poultry. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

### PI 233 Poultry Plant Design and Equipment (2)

Designing and planning a modern commercial poultry operation. Engineering of buildings and equipment to specific commercial functions. Coordination of buildings, equipment and operations designed for maximum plant efficiency. 1 lecture, 1 laboratory.

### PI 305 Game Bird Propagation and Management (3)

GEB F.2.

Game bird anatomy, physiology and nutrition. Health, natural and artificial reproduction, and rearing techniques as practiced in public resource programs and private enterprises. 3 lectures. Prerequisite: One quarter college mathematics, one quarter animal biology and CHEM 121.

### PI 306 Game Bird Propagation and Management Laboratory (1)

GEB F.2.

Field trips and basic skills in propagation and management in support of PI 305. 1 laboratory. Prerequisite or concurrent: PI 305.

### PI 322 Poultry Business Organization (4)

Organization and management of a commercial hatchery operation. Recruiting and supervising personnel, organizing flow of products and planning the distribution systems. Managing the finance, advertising, public relations, and sales phases of commercial poultry enterprise. 3 lectures, 1 laboratory.

**PI 323 Poultry Diseases and Hygiene (4)**

Management, sanitation and vaccinating programs for the maintenance of the flock health. Control and prevention of diseases and parasites. 3 lectures, 1 laboratory. Prerequisite: BACT 221.

**PI 331 Turkey Industry (3)**

Coordination and operation of a commercial turkey enterprise. Application of nutritional, breeding, disease control and marketing practices. Planning and supervising the specialized phases of the turkey enterprise. Development of new products and specialized marketing techniques. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**PI 333 Applied Poultry Feeding and Nutrition (4)**

Nutritional requirements, feeding principles and modern practices. Formulation of rations for specific purposes and commercial economy practices. Feed industry distributive procedures. 3 lectures, 1 laboratory. Prerequisite: DH 101, CHEM 326 or consent of instructor.

**PI 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**PI 422 Advanced Poultry Enterprise Supervision (3)**

Coordination and supervision of the modern commercial poultry enterprise. Analysis of operational procedures, efficiency practices, cost and quality control techniques. Interrelationship of business practices to the enterprise success. 3 lectures. Prerequisite: Consent of instructor.

**PI 431 Applied Poultry Breeding (4)**

Genetic applications in the development of commercial poultry stocks for specific productive designs. Application of commercial breeding techniques for flock improvement. Analysis of breeding records. 3 lectures, 1 laboratory.

**PI 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**PI 463 Undergraduate Seminar (2)**

Preparing and presenting in an organized manner reports on new trends, special problems, research developments related to the poultry industry. Group discussion of industry special problems. 2 seminars.

**PI 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures.

Prerequisite: Consent of instructor.

**PI 581 Graduate Seminar in Poultry (3)**

Current trends and characteristics of the poultry industry enterprise. Group discussion of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 seminars.

## **POLS—POLITICAL SCIENCE**

**POLS 100 Introduction to Political Science (3)**

Introduction to the scope, language, concepts and approaches of the discipline of political science. 3 lectures.

**POLS 102 California Government (3)**

California and local political institutions. Processes, structure and function of policy making at the state and local level. Completion of POLS 210 will satisfy the California state requirements in the United States Constitution, state and local government. 3 lectures.

**POLS 105 Introduction to International Relations (3)**

Introduction to dynamics, character and substance of power relations among nations; conflict and accommodation, including the nature of the state and the international community. 3 lectures.

**POLS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**POLS 204 Basic Concepts of Political Thought (3)**

Introduction to major concepts (such as authority, equality, force, individual, justice, law, political obligation, power, rights, state) which affect our thinking about social relations. Social and political theories of thinkers from Socrates to Machiavelli. 3 lectures.

**POLS 206 Judicial Process (3)**

Examination of the legal process with emphasis on the social and political influences affecting the law and its enforcement. Topics considered include types of law, the structure of the judicial system including Supreme Court decision making, police, judges and lawyers. 3 lectures.

**POLS 210 American and California Government (3)****GE B D.1.**

Origin, nature, and distribution of political power. Declaration of Independence. Constitution of the United States. Function and current problems of national, state and local government. Finding and evaluating authoritative source materials on political affairs. 3 lectures.

**POLS 212 Comparative Politics (3)**

Comparative study of the government of the United Kingdom and other selected Western European countries. 3 lectures. Prerequisite: POLS 210.

**POLS 250 Model United Nations (2)**

Preparation for participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statements suitable for use in mock United Nations sessions. May be repeated to six units. 2 lectures. Prerequisite: One course in POLS or consent of instructor.

**POLS 303 Minority Group Politics (3)**

Analysis of political factors affecting minority groups in America. Involvement, organization and role of minority groups in the political process. Emphasis on the political behavior of black and chicano minorities. 3 lectures. Prerequisite: POLS 210.

**POLS 304 Politics of Global Survival (3)**

Inquiry into the political options available to the human race in dealing with such interrelated subjects as population, hunger, urbanization, energy, the environment, endangered species, and climate. 3 lectures. Prerequisite: POLS 210.



**POLS 305 Political Analysis (5)**

Introduction to methodology research design and quantitative methods used in survey research and political analysis. Bi-variate inferential statistics and elementary computer programming in SPSS will be used to analyze political phenomena. 3 lectures, 2 laboratories. Prerequisite: POLS 100, STAT 211.

**POLS 306 Modern Political Thought (3)**

Theories of political control and the relationship between man and the state. 3 lectures. Prerequisite: POLS 210.

**POLS 307 American Political Thought (3)**

Central political ideas of America's leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: POLS 204, POLS 210.

**POLS 308 Revolutions and Collective Violence (3) (Also listed as SOC 308)**

Causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of collective violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science or consent of instructor.

**POLS 310 Jurisprudence (3)**

Science of law as developed in the Western legal tradition. Definitions of laws and their implications for such associated legal concepts as justice, rights, punishment, causation and responsibility. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 311 Inter-American Relations (3)**

Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agriculture methods. Opportunities for employment in agriculture, engineering, and business. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: POLS 210, HIST 204.

**POLS 312 International Politics (3)**

International political processes and problems; foreign policies and politics in relations between states; conflicts and adjustments. Analyses of selected problems. 3 lectures. Prerequisite: POLS 105.

**POLS 313 National Security Policy (3)**

Theoretical approaches to the study of war and peace and the evolution of contemporary defenses and strategies, especially those pertaining to the United States. Impact of national strategy on both national and international politics. 3 lectures. Prerequisite: POLS 105 or POLS 210 or advanced standing in ROTC.

**POLS 314 Public Administration (3)**

Development of the executive functions in government. Making and carrying out public policy by government in the United States. Survey of administrative concepts and cases. 3 lectures.

**POLS 318 Administrative Theory and Behavior (3)**

Conceptual examination of the theory and behavior of large and small bureaucracies. Role of the individual in the organization. Social, psychological and behavioral theories of organization. 3 lectures. Prerequisite: POLS 210, POLS 314.

**POLS 319 Public Personnel Administration (3)**

Processes of managing human resources in the public service. Theory and practice of personnel administration, civil service system. labor issues. 3 lectures. Prerequisite: POLS 210, POLS 314 or consent of instructor.

**POLS 321 American Constitutional Law (3)**

Basic principles of American constitutional law. Role of the Supreme Court as arbiter of separation of powers and federalism. 3 lectures. Prerequisite: POLS 102, POLS 210.

**POLS 322 Civil Liberties (3)**

Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, civil and criminal procedural guarantees, search and seizure, due process, and equal protection of the laws. 3 lectures. Prerequisite: POLS 102, POLS 210.

**POLS 325 Public Policy Analysis (3)**

Methods of analyzing the actions or inactions of government. Techniques for evaluating the outputs and impacts of governmental policies. Comparisons of various domestic issue areas such as transportation, education, housing, welfare, and law enforcement. 3 lectures. Prerequisite: POLS 210.

**POLS 331 Political Parties and Interest Groups (3)**

Makeup and major functions of political parties. Role of political parties and special interest groups in a democracy. Degree of consensus and conflict between present day political parties and special interest groups in their attempts to influence public policy. 3 lectures. Prerequisite: POLS 210.

**POLS 332 Public Opinion and Political Participation (3)**

Origins and dimensions of public opinion. Focus on contemporary political campaigns and elections in the U.S. Impact of political ideology, mass media, high technology, pressure groups on electoral outcomes. Voting behavior and other forms of political participation in the U.S. 3 lectures. Prerequisite: POLS 210.

**POLS 335 Legislative Process (3)**

Organization and procedures of Congress, state and local legislative bodies, theory and practices of representative government. Problems of representation in selected political systems. 3 lectures. Prerequisite: POLS 210.

**POLS 340 Government Internship (1-12) (CR/NC)**

Supervised work experience in a government or related public agency as approved by the school dean. Intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Maximum of 4 units of credit per quarter except for full-time assignments in Sacramento, Washington, D.C. or equivalent. Credit/No Credit grading. Recommended preparation: Junior standing with a minimum 2.5 GPA.

**POLS 342 The American Presidency (3)**

Nature and problems of contemporary presidential leadership emphasizing the impact of bureaucracy, congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: POLS 210.

**POLS 350 Advanced Model United Nations (2)**

Participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statement for use in mock United Nations sessions. May be repeated to 6 units. 2 lectures. Prerequisite: POLS 250 or consent of instructor.

**POLS 370 Contemporary Global Political Issues (3)**

GEB D.4.b.

Current international political issues with different course sections addressing a specific theme as published in the Class Schedule. Typical themes include: global security, resource politics, world tension areas, regional politics, and world organizations; issues, problems, and conflicts in the international arena; relationship of western and nonwestern countries to these issues, emphasizing both causes and effects. 3 lectures. Prerequisite: Junior standing.

**POLS 371 World Food Politics (3)**

Self-reliant, food-first politics of the hungry poor in the less-developed countries; political support of food policies in the U.S. and other developed nations. Moral, ecological and commodity politics of food in a variety of cultural settings which direct food production, consumption and distribution and reduce food demand through population stabilization. 3 lectures. Prerequisite: Junior standing.

**POLS 380 Political Behavior (3)**

Political behavior of individuals and groups examined in light of biological, economic, psychological and social-psychological theories and research. 3 lectures. Prerequisite: POLS 210.

**POLS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**POLS 401 State and Local Government (3)**

Structure, function and problems of state, county, and local governments. 3 lectures. Prerequisite: POLS 210.

**POLS 402 Politics of Developing Areas (3)**

Process of political development in the Third World with appropriate examples taken from particular areas and countries. 3 lectures. Prerequisite: POLS 210.

**POLS 403 Municipal Government (3)**

Organization, politics, and problems of contemporary American municipalities. Trends in city life and government. 3 lectures. Prerequisite: POLS 102 or POLS 210.

**POLS 404 Science, Technology and Public Policy (3)**

Analysis of the problems stemming from the relationship of technology and politics. Ecology, energy crisis, civilian-military complex, electronic eavesdropping, governmental support of technology, policy implications of technological change. Individual's role and responsibilities in a democracy. 3 lectures. Prerequisite: POLS 210 or equivalent.

**POLS 405 Politics of Finance and Planning (3)**

Political and economic considerations affecting the decision-making process. Intergovernmental relations in finance, debt management. Appropriations and audits in government departments, commissions and government bodies. 3 lectures. Prerequisite: POLS 210 or consent of instructor.

**POLS 411 Contemporary U.S. Foreign Policy (3)**

Formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy; diplomacy, propaganda, economic operations, psychological warfare, and military strategies. 3 lectures. Prerequisite: POLS 105.

**POLS 417 Asian Politics (3)**

Analysis of political, economic, and social institutions and conditions in selected Asian nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 418 Soviet Politics (3)**

Analysis of political, economic, and social institutions and conditions of the U.S.S.R. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**POLS 463 Undergraduate Seminar (3)**

Preparation and presentation of current developments in the field of political science. 3 seminars. Prerequisite: POLS 461, POLS 462 or consent of instructor.

**POLS 465 Middle Eastern Politics (3)**

Analysis of political, economic, and social institutions and conditions of the countries of the Middle East and North Africa. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 468 African Politics (3)**

Analysis of indigenous institutions, Western influences, and nationalism in Africa south of the Sahara. Selective area studies illustrative of colonialism and the politics of independence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**POLS 510 Administration in Developing Nations (3)**

Processes of administration with reference to the differing cultural, political, and economic environments of the developing areas of the world. 3 seminars. Prerequisite: Graduate standing.

**POLS 590 Seminar in Political Science (3)**

Special problems in selected areas of Political Science. Each seminar will have a subtitle describing its nature and content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

**PSC—PHYSICAL SCIENCE****PSC 101 The Physical Environment: Matter and Energy (4)****GEB B.1.a.**

Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 laboratory.

**PSC 102 The Physical Environment: Atoms and Molecules (4)****GEB B.1.a.**

Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 recitation. Prerequisite: PSC 101.

**PSC 103 The Physical Environment: Earth and the Universe (4)****GEB B.1.a.**

Introduction to the basic principles of the earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the earth, earthquakes, weather, oceanography, solar system, stars, and cosmology. 3 lectures, 1 recitation. Prerequisite: PSC 101.

**PSC 110 Energy for the Present and the Future (3)****GEB B.1.a.**

Detailed qualitative presentation of current and future energy sources along with the associated environmental problems. Energy production, energy consumption, energy conservation, fossil fuels, nuclear fission and alternative sources such as solar, geothermal and fusion energy. 3 lectures.

**PSC 171 Science and Society (3)****GEB B.1.a.**

Interdisciplinary approach to contemporary science-society issues such as the energy crisis, the arms race, environmental issues, nuclear power. Class schedule will list topic selected. 3 lectures.

**PSC 201 Introduction to Physical Oceanography (3)****GEB B.1.a.**

Origin, extent of oceans; nature of sea bottom, sediments. Causes, effects of ocean circulation, tides and waves. Physical properties of sea water. Transmission of heat, sound and light. Shorelines and shoreline processes. One or two field trips. 3 lectures.

**PSC 303 Earth and Space Science (4)**

GEB B.1.a.

Concept oriented treatment of astronomy and space science, geology, oceanography, atmospheric physics, and meteorology designed for prospective elementary teachers. 2 lectures, 1 recitation, 1 activity. Prerequisite: PSC 101, PSC 102, consent of instructor.

**PSC 424 Organizing and Teaching of Physical Sciences (3)**

Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Evidence of satisfactory preparation in physics and chemistry.

**PSC 436 Demonstration Experiments in Physical Science (1)**

Investigation and illustration of the principles of physical science through demonstration experiments, designed and assembled by students according to their background and interest, largely from inexpensive, easily obtainable materials. Total credit limited to 2 units. 1 activity. Prerequisite: 6 quarter units of physical science.

**PSC 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

## PSY—PSYCHOLOGY

**PSY 104 Effective Study Techniques (2) (CR/NC)**

Designed to acquaint students with basic aims and objectives of going to college and to provide adequate instruction and practice in specific study skills such as: effective study methods, note-taking, time-planning, memory, concentration, reading and test taking. Credit/No Credit grading. 2 lectures.

**PSY 201 General Psychology (3)**

GEB E.1.

Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. 3 lectures. A student may enroll for credit in either PSY 201 or PSY 202, but not both.

**PSY 202 General Psychology (3)**

GEB E.1.

Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. 2 lectures, 1 recitation. A student may enroll for credit in either PSY 202 or PSY 201, but not both.

**PSY 212 Interpersonal Communication (3) (Also listed as SPC 212)**

Introduction to the interaction process through study of and practice in effective participation in group activities, self-disclosure, expressing points of view, active listening, sending responsible feedback and management of nonverbal behavior. 3 lectures.

**PSY 251 Laboratory in Group Activities (1-3) (CR/NC)**

Skills and techniques of solving problems in large and small groups; conducting and reporting meetings; analyses of leadership dynamics in campus organizations. Credit/No Credit grading. Total credit limited to 6 units. 1-3 activities.

**PSY 301 Psychology of Personal Development (3)**

Approaches to self-exploration and self-modification; conceptions of human potential; evaluation and development of personal effectiveness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 302 Behavior in Organizations (3)**

Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization; motivation, leadership, group phenomena, communication, decisionmaking, attitudes, personnel selection and organizational change. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 303 Human Sexuality (2) (CR/NC)**

Understanding aspects of personal sexuality. Sexual development, attitudes, role awareness, intimacy, biological aspects of sexuality, homosexuality, sexual dysfunction, family planning and birth. Credit/No Credit grading. 2 lectures.

**PSY 304 Comparative and Physiological Psychology (3)****GEB E.2.**

Variables relevant to the interaction of physiological and behavioral processes. Learning, motivation, emotion, perception, individual differences, social and abnormal behaviors as a function of the nervous and endocrine systems, sensory structures, genetic factors, effects of drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 307 Abnormal Psychology (3)**

Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes organic mental disorders; substance abuse; psychoses; affective, anxiety, psychosexual, psychosomatic and personality disorders. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 308 Psychology of Consciousness (3)**

Characteristics and functions of selected, qualitatively unique patterns of consciousness such as hypnosis, meditation, dreaming, drug experiences and parapsychological phenomena, with particular emphasis on adaptive and maladaptive expressions of these states of consciousness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 310 Death, Dying and Bereavement (3)**

Scientific and experiential investigations of dying and bereavement. Cross-cultural, historical, medical, legal, and developmental perspectives. Demography, care of the dying, grieving, funerals, search for immortality, megadeath, suicide, euthanasia. Meaning of life in the context of death. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 311 Human Factors and Environmental Psychology (3)**

Human sensory, perceptual and cognitive capabilities and limitations and their effects on task performance. Effects of the physical environment upon individuals and groups, and behavioral effects on the environment. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 317 Psychology of Stress (3)**

Examines the present status of research in psychology on the relationship between stress and psychological and physical well-being; psychological factors influencing stress; description and critical evaluation of methods of stress reduction. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 320 Behavioral Effects of Drugs and Alcohol (3)**

Behavioral effects of the major categories of drugs. Factors influencing a person's choice to use and abuse drugs; personal and social consequences of drug abuse. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 330 Nonverbal Communication (3) (Also listed as SPC 320)**

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 3 lectures. Prerequisite: SPC 212 or consent of instructor.

**PSY 401 Social Psychology (3)**

Human behavior as it is influenced by other people and social situations. Socialization processes, attitude formation and change, aggression, behavior in groups, impression formation and factors involved in attraction, love and prejudice. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 421 Developmental Processes (3) (Also listed as CFD 421)**

Critical examination of developmental processes in the three major domains of development: psychomotor-physiological, social-affective, and cognitive. Particular attention to the identification, assessment and relevance of specific processes and to factors that influence and facilitate their development. Class schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: CFD 125, CFD 225, CFD 230 and CFD 325, or graduate standing and consent of instructor.

**PSY 432 Psychological Testing (3)**

Principles and procedures of selection, administration, scoring, and interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: 9 units of psychology.

**PSY 454 Personality (3)**

Personality theories and research; human motivation; description and development of personality characteristics; adaptation and self-actualization. 3 seminars. Prerequisite: PSY 201 or PSY 202.

**PSY 455 Learning and Motivation (3)**

Principles of conditioning, motivation, verbal learning, observational learning, concept formation, language development, and memory; applications to problems such as behavior disorders, learning disabilities, mental retardation, drug abuse, aggression and prejudice. 3 seminars. Prerequisite: PSY 201 or PSY 202.

**PSY 456 Behavioral Disorders in Children (3)**

Applications of psychological principles to childhood behavioral disorders: aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 3 seminars. Prerequisite: PSY 201 or PSY 202.

**PSY 457 Leisure Counseling (3) (Also listed as REC 457)**

Philosophical, psychological, educational and practical aspects of leisure counseling. Historical foundations and leisure counseling models. 2 lectures, 1 laboratory. Prerequisite: REC 252 or consent of instructor.

**PSY 459 Life Span Development (3) (Also listed as CFD 459)**

Theories of psychological development. Emphasis on developmental stages and corresponding tasks, emotions, and behaviors. Continuities and orderly sequences in development. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**REC—RECREATION ADMINISTRATION****REC 101 Introduction to Recreation and Leisure Services (3)**

History, philosophy, theory, and community organization of recreation. Various agencies providing recreation and leisure services. Emphasis upon functions, areas, facilities, clientele, and career opportunities. Field visits required. 3 lectures.

**REC 103 Outdoor Recreation Skills (3)**

Introduction to a wide variety of outdoor recreation and leisure pursuits with emphasis upon skill acquisition. Miscellaneous course fee required—see Class Schedule. 2 lectures, 1 laboratory.

**REC 105 Recreation Leadership (3)**

Recreation leadership with small and large groups. Emphasis upon appropriate theories and techniques for specific clientele. 2 lectures, 1 laboratory.

**REC 210 Programming for Leisure (3)**

Methods of program planning, organization, implementation and evaluation in public and private settings; interrelationship of needs and interests of people, physical settings, and activity content; emphasis on program construction and scheduling. 2 lectures, 1 two-hour laboratory. Prerequisite: REC 101, REC 105 or consent of instructor.

**REC 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as PE 245)**

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 two-hour laboratory.

**REC 252 Recreation for People with Disabling Limitations (4)**

Adaptation of recreation and leisure services for persons with special needs or limitations; role of institutions and community agencies; specialized leadership techniques; modification requirements for programs, areas, facilities, equipment, and supplies. Field visits required. 3 lectures, 1 laboratory. Prerequisite: REC 210 or consent of instructor.

**REC 260 Intramural-Recreational Sports (3)**

Principles and policies underlying programs of intramural recreational sports in secondary schools and community centers. 2 lectures, 1 activity.

**REC 310 Program Administration in Leisure Services (3)**

Management of a full service program delivery system in a variety of settings: needs assessment, program selections, marketing and promotion of a full scope of services and seasonal evaluation. Field visits required. 3 lectures. Prerequisite: REC 210.

**REC 312 Employee Recreation (1)**

Administrative patterns, financing, programming staffing and legal concerns in programs designed for employee motivation and productivity. 1 seminar. Prerequisite: Junior standing or consent of instructor.

**REC 314 Travel and Tourism—Implications for Leisure (1)**

Trends of travel and tourism, planning needs for community tourism ventures and staffing requirements. 1 seminar. Prerequisite: Junior standing or consent of instructor.

**REC 323 Supervisory Roles in Recreation Administration (3)**

Analysis of the supervisory roles in public, private, commercial and voluntary agencies offering organized leisure services. Methods, techniques, and evaluation systems. Field visits required. 3 lectures. Prerequisite: REC 210.

**REC 324 Organizational Patterns of Recreation Administration (3)**

Scope, levels, concepts, structure, and legal aspects of public, private, commercial and voluntary recreation and leisure services agencies. Emphasis upon the development of a professional philosophy. Field visits required. 3 lectures. Prerequisite: REC 101, REC 105, REC 210.

**REC 328 Aging and Leisure (3)**

Analysis of the psycho-social aspects of aging as related to leisure and recreation; physiological responses to leisure activity; special precautions and activity adaptations. Field visits required. 3 lectures. Prerequisite: REC 252 or consent of instructor.



**REC 329 Interrelationship of Treatment Services (3)**

Identification and definition of disciplines serving on the treatment team; analysis of factors which promote cooperation among team members and maximize effectiveness of services to clientele. 3 lectures. Prerequisite: REC 252.

**REC 337 Implementation of Outdoor Recreation Programs (3)**

Implementation of leisure programs in organized camps and related settings. Qualifications and duties of outdoor recreation personnel; professional opportunities in the field. 2 lectures, 1 two-hour laboratory. Prerequisite: REC 103 or consent of instructor.

**REC 352 Recreation Therapy (4)**

Philosophy, principles, and techniques in the use of recreation as a treatment modality in rehabilitating people with illness or disabling limitations. Sociological foundations of recreation and leisure in the community and implications for the exceptional individual. Role of recreation in total rehabilitation process of various agencies. Field visits required. 2 lectures, 2 laboratories. Prerequisite: REC 252 or consent of instructor.

**REC 364 Commercial Recreation and Leisure Services (3)**

Analysis of the types of commercial and private recreation enterprises; probable trends and directions; requirements and procedures for planning and organizing commercial recreation services. Field visits required. 2 lectures, 1 activity. Prerequisite: REC 210 or consent of instructor.

**REC 369 Research in Recreation Administration (3)**

Research design and methods; questionnaire and interview schedule construction, sampling, methods, data array and analysis. Discussion of potential senior project topics. 3 lectures. Prerequisite: Junior standing and consent of instructor.

**REC 400 Special Problems For Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units with a maximum of 3 units per quarter. Prerequisite: Consent of curriculum coordinator.

**REC 416 Physical Education/Recreation Facilities (3) (Also listed as PE 416)**

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance, and equipment as related to physical education and recreation areas and facilities. Field visits required. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

**REC 424 Management of Recreation and Leisure Services (3)**

Roles of management: financing, managing and marketing leisure services; emphasis on budgeting, and community relations. Field visits required. 3 lectures. Prerequisite: REC 324.

**REC 430, 431 Directed Field Experience (3) (3)**

Practical work experience in related phases of recreation administration in organization or agency approved by curriculum coordinator. 200 hours required in field for each course. Individual conferences as required. Prerequisite: REC 103, REC 252, REC 323, REC 324, REC 364, senior standing, approval of curriculum coordinator. Therapeutic Recreation students also must have completed concentration courses prior to selection of and placement in a California Board of Park and Recreation Personnel (CBPRP) approved site.

**REC 432 Internship (9)**

Directed full-time professional experience in a recreation agency. Comprehensive exposure to agency's resources and program. Individual development in program planning, conduct and evaluation; budget and finance, legal aspects; community and public relations. Prerequisite: REC 324, senior standing, 2.50 GPA overall, approval of curriculum coordinator. Therapeutic Recreation students also must have completed concentration courses for placement in California Board of Park and Recreation Personnel (CBPRP) approved site.

**REC 457 Leisure Counseling (3) (Also listed as PSY 457)**

Philosophical, psychological, educational and practical aspects of leisure counseling. Historical foundations and leisure counseling models. 2 lectures, 1 laboratory. Prerequisite: REC 252 or consent of instructor.

**REC 461, 462 Senior Project (3) (2)**

Selection and completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 150 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of REC 369.

**REC 464 Delivery of Commercial Recreational Services (3)**

Requirements and procedures for opening, operating, and evaluating commercial recreation enterprises. 2 lectures, 1 laboratory. Prerequisite: REC 364 or consent of instructor.

**REC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**REC 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to graduate and undergraduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**SOC—SOCIOLOGY****SOC 105 Introduction to Sociology (3)****GEB D.4.a.**

Orientation to the nature of the study of society; survey of approaches to social analysis. Emphasis upon primary concepts describing environment, social structure, and social change for increased understanding of human relations. An overview of the systems of social relationships. 3 lectures.

**SOC 106 Social Problems (3)**

Appraisal of various factors from which the social problems of contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.

**SOC 205 Sociology of Popular Culture (3)**

Investigation of the social content of radio, television, popular literature, motion pictures, popular music, and other relevant popular art forms. Analysis of these art forms as they mirror and influence contemporary social themes in the United States. 3 lectures. Prerequisite: One sociology course or consent of instructor.

**SOC 206 Sociology of Family Life (3)**

Description and analysis of the social relationships within the family group. Examination of alternative solutions to problems which arise in family living. 3 lectures.

**SOC 301 Social Work in the U.S.A. (3)**

Introduction to the field of social welfare; the development of American social work; scope and diversity of specific programs designed to meet welfare problems in contemporary society. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 302 Social Welfare Institutions (3)**

Development of public welfare services; current problems and policy issues; analysis of current programs of social insurance, public assistance programs; interagency relationships. 3 lectures. Prerequisite: SOC 301 or consent of instructor.

**SOC 305 Sociology of Social Movements (3)**

Analysis of the causes and impact of social movements, with a focus on the contemporary world. Included in this analysis are events ranging from riots, lynchings and panics to political, religious and racial social movements. 3 lectures. Prerequisite: Three units of sociology or consent of instructor.

**SOC 308 Revolutions and Collective Violence (3) (Also listed as POLS 308)**

Focus on the causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of political violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 309 World Social System and Its Problems (3)**

GEB D.4.b

Analysis of the world social system, its structure, its effects upon developed and developing nations, and the relations among the nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 310 Socialization: Self and Society (3)**

Analysis of social interaction relating to development of self; reciprocal influences between individuals and society. Development of social roles and the symbolic nature of interaction. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 311 Sociology of Sex Roles (3)**

Description and analysis of sex roles in modern society. Special attention given to the learning process and how sex stereotypes affect individuals' life chances and the social structure. Exploration of the sociobiological bases of sex role differentiation in societies. 3 lectures. Prerequisite: One course in Sociology or consent of instructor.

**SOC 313 Urban Sociology (3)**

Structure of social relationships in the community; physical structure of communities; patterns of community cooperation and conflict; changing patterns of urban community life; social class and political influence on the community level. 3 lectures. Prerequisite: One sociology course or consent of instructor.

**SOC 315 Race Relations (3)**

GEB D.4.b.

Diverse structures of unequal relationships among racial and ethnic groups in several countries. Theories about sources of economic and social discrimination. Evaluation of methods to restructure race and ethnic relations. International case histories. 3 lectures. Prerequisite: Junior standing.

**SOC 316 American Minorities (3)**

Problems in assimilation of the Afro-American, Mexican-American, and American Indian. Analysis of internal group structures and external factors impeding assimilation of these minorities. Dynamics of intergroup relationships. Assessment of current programs aimed at assimilation. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 323 Social Stratification (3)**

Social class and the distribution of status and power in society, with emphasis on contemporary United States; social mobility; relationships of stratification to mental illness, race, family systems, crime and delinquency, etc. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 326 Sociology of Aging (3)**

Age as a social phenomenon. Roles of the elderly in industrial societies. Changes in social structures and people as the shift occurs from middle to older age. Sociological theories about aging. Implications of an aging population. Public policies and aging. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 330 Social Change (3)**

Description and analysis of social change in contemporary American society as it relates to major revolutionary changes in this century; variables alleged to affect social change; impact of social change upon traditional societies; prospects for future social change. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 333 Social Research Methods I (3)**

Survey research experimentation, field research and content analysis as research techniques. Relationship between theory and research conceptualization and operationalization. Basic sampling techniques. Approaches to interviewing. 3 lectures. Prerequisite: Two sociology courses and STAT 211 or consent of instructor.

**SOC 334 Social Research Methods II (3)**

Univariate and multivariate data analysis using packaged statistical computer programs. Scale and index development. Casual analysis. 2 lectures, 1 laboratory. Prerequisite: SOC 333.

**SOC 344 Sociology of Poverty (3)**

Variable indicators of poverty in modern society. Chief features of the subculture of the poor. Analysis of different explanations for the persistence of poverty. Survey of proposals for reducing poverty. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 350 Cultures and Societies (3)**

Cultural features and major social issues of a selected world area. Each time offered it will bear a subtitle describing the particular world area to be studied. Repeatable to a total of 9 units provided area studied is not duplicated. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 377 Medical Sociology (3)**

Analysis of the organization and operation of modern medicine emphasizing the interplay of several roles in medical practice. Interplay between organized and unorganized medicine, the health professions, and other structures of modern society. 3 lectures. Prerequisite: One sociology course or consent of instructor.

**SOC 402 Crime and Delinquency (3)**

Theories of delinquent and criminal behavior; analysis of institutional and other approaches to rehabilitation of criminals and delinquents. 3 lectures. Prerequisite: Junior standing.

**SOC 412 Treatment of Criminals and Delinquents (3)**

Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 3 lectures. Prerequisite: SOC 402.

**SOC 413 Methods of Social Work (3)**

Theories, concepts, values stressed in social work. Social casework. Principles and practices used by social workers serving individuals and families in correctional, public assistance, medical, psychiatric youth services, and other settings. Discussion of case material and available literature. 3 seminars. Prerequisite: SOC 302.

**SOC 414 Social Work Practicum (3)**

Social-intervention practice model and its application. Social intervention goals and strategy. Social workers and social agencies. Professional social work skills in assessment, observation, interviewing, engagement, communication, and intervention activities. Reading and discussion of illustrative cases. 3 lectures. Prerequisite: SOC 301 and SOC 302 or consent of instructor.

**SOC 421 Social Theory (3)**

Concepts and theories in sociology, anthropology and geography. Modern and classical perspectives. Usefulness of theories for understanding present social problems. 3 lectures. Prerequisite: Two sociology courses or consent of instructor.

**SOC 431 Population Problems (3)**

Description and analysis of population variables and their sociological consequences. 3 lectures. Prerequisite: One sociology course and STAT 211 or consent of instructor.

**SOC 470 Selected Advanced Topics in Sociology (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SOCS—SOCIAL SCIENCES****SOCS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SOCS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SOCS 424 Organizing and Teaching Social Sciences (3)**

Organization, selection, presentation, application, and interpretation of social sciences subject matter for teaching of high school civics and social problems. 3 lectures. Prerequisite: Admission to the teacher education program or possession of valid teaching credential.

**SOCS 440 Supervised Field Work (3)**

Supervised observation, research and work in community organizations, public agencies, etc., with attention to the barrio and ghetto. Prerequisite: Senior standing and/or consent of instructor. Total credit limited to 9 units.

**SOCS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

**SOCS 463 Undergraduate Seminar (3)**

Intensive study of selected social problems with application of techniques for analysis. 3 seminars. Prerequisite: Senior standing or consent of instructor.

**SPAN—SPANISH****SPAN 101, 102, 103 Elementary Spanish (5) (5) (5)**

GEB C.3.

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures, 1 activity. May not be taken for credit by native speakers or anyone who has previously studied Spanish.

**SPAN 104 Intensive Elementary Spanish (15)**

Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Not open to students with credit in SPAN 101, 102, 103. Laboratory drill required. 15 lectures.

**SPAN 123 Spanish Phonetics (2)**

Help the student acquire correct Spanish pronunciation by eliminating English sounds. 1 lecture, 1 activity. Prerequisite: SPAN 101 or equivalent.

**SPAN 201, 202, 203 Intermediate Spanish (3) (3) (3)**

GEB C.3.

Review of Spanish grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. 2 lectures, 1 activity. Prerequisite: SPAN 103 or consent of instructor.

**SPAN 204 Intensive Intermediate Spanish (9)**

Review of grammar and practice in written and oral expression based on social and cultural values. 9 lectures. Prerequisite: SPAN 103 or SPAN 104 or permission of instructor.

**SPAN 221, 222, 223 Spanish Conversation (2) (2) (2)**

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement intensive oral classroom practice. To be taken in numerical sequence. 2 lectures. Prerequisite: SPAN 103 or consent of instructor. Simultaneous enrollment in SPAN 201, 202, 203 is recommended.

**SPAN 301 Review of Spanish Grammar and Composition (3)**

Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 3 lectures. Prerequisite: SPAN 203.

**SPAN 302 Advanced (Spanish) Conversation (3)**

Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to illicit spontaneous response. Group presentations to allow cooperative research and preparation. 3 lectures. Prerequisite: SPAN 203, SPAN 223, or equivalent or consent of instructor.

**SPAN 305 Significant Writers in Spanish (4)**

GEB C.3.

Selected Spanish writers, as individual writers or in groups. 4 lectures. May be repeated to 12 units. Prerequisite: SPAN 203 or equivalent.

**SPAN 330, 331 Spanish Composition for the Bilingual Student (4) (4)**

Spanish-English contrastive analysis underlining linguistic and semantic differences and similarities. Essay techniques and translation practice. Vocabulary building, spelling, syntax, difficult grammatical idiomatic expressions, and the Chicano Spanish lexicon. 3 lectures, 1 activity. Prerequisite: SPAN 203 or consent of instructor. (Oral proficiency must be demonstrated.) Does not fulfill upper division minor requirements.

**SPAN 401 Translation Practice (4)**

Practice in translating from English to Spanish and vice versa, eliminating vocabulary, syntax and idiom influence from translated language. May be repeated to 8 units. 3 lectures, 1 activity. Prerequisite: SPAN 301.

**SPAN 405 Spanish Literature in English Translation (3)**

GEB C.3.

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding Spanish writers. Lecture in English. Class schedule will list topics selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Consent of instructor.

**SPAN 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SPC—SPEECH COMMUNICATION****SPC 101 Professional Fields of Speech (1)**

Occupational opportunities, professional organizations, and important journals in the various fields of speech. Development and trends in forensics, discussion, theatre arts, and speech correction. 1 lecture.

SPC 125 *Critical Thinking* (3) (Also listed as ENGL 125 and PHIL 125) GEB A.2.

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

SPC 201 *Public Speaking* (3) GEB A.3.

Introduction to the principles and types of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SPC 202. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

SPC 202 *Principles of Speech* (3) GEB A.3.

Introduction to the fundamentals and principles which underlie effective speech communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in SPC 201. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

SPC 203 *Voice and Articulation* (3)

Physiology of normal speech; assessment and improvement of students' vocal and articulation practices to enhance oral skills. 3 lectures.

SPC 212 *Interpersonal Communication* (3) (Also listed as PSY 212)

Introduction to the interaction process through study of and practice in effective participation in group activities, self-disclosure, expressing points of view, active listening, sending responsible feedback and management of nonverbal behavior. 3 lectures.

SPC 217 *Essentials of Discussion* (4)

Basic principles and techniques of discussion. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures.

SPC 250 *Forensic Activity* (1)

Lower division participation in intercollegiate forensic activities. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Specific assignments will be determined by instructor. May be repeated to 6 units. 1 activity.

SPC 300 *Phonetics* (3)

Phonetic basis of speech sounds in American English, their development, symbolization, production, and characteristics; practice in broad transcription, using the International Phonetic Alphabet. 3 lectures.

SPC 301 *Industrial and Professional Speech* (3)

Speech in industrial, professional, and informal business including interviews, sales talks, and conference speaking. Preparation of oral reports in business and professional situations. 3 lectures. Prerequisite: SPC 201 or SPC 202 or consent of instructor.

SPC 302 *Introduction to Communicative Disorders* (4)

Survey of speech, language, and hearing disorders emphasizing causes, symptoms, and treatment; role of the speech therapist in the community and in public schools; role of the classroom teacher in speech improvement. 4 lectures.

SPC 303 *Development of Speech and Language* (4)

Development of speech and language from birth to adolescence. Physical and psychological processes contributing to the emergence, practice, and mastery of speech and language. 4 lectures. Prerequisite: SPC 300, SPC 302.

SPC 305 *Oral Interpretation* (4)

Poetry, prose, nonfiction and dramatic literature through the individual performance. Literary works are performed as a critical act illuminating meanings within a text and conveying them to an audience. 4 lectures. Prerequisite: SPC 201 or SPC 202, 3 units of literature.

**SPC 310 Performing Literature in the Classroom (3)**

Techniques of oral interpretation; selection, preparation, and presentation of literature. Problems unique to story reading and telling, poetry and prose, choral reading and group performance in preschool through secondary levels. 3 lectures.

**SPC 312 Communication Theory (4)**

Concepts and theories of the human communication process. Psycho-sociological aspects of attitude change. Interpersonal relations in an informational-behavioral context. 4 lectures. Prerequisite: PSY 201 or PSY 202, SPC 212, consent of instructor.

**SPC 316 Cross-Cultural Communication (3)**

Examination and clarification of communication problems within and between ethnic groups. 3 lectures.

**SPC 320 Nonverbal Communication (3) (Also listed as PSY 330)**

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 3 lectures. Prerequisite: SPC 212 or consent of instructor.

**SPC 322 Persuasion (4)**

Persuasive theory including methods of attention, suggestion, motivation, and adaptation employed to influence feelings, attitude, change and action. Analysis of persuasive discourse and the application of persuasive methods in speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

**SPC 325 Argumentation and Debate (4)**

Techniques of argumentation and their application to debate; logic and reasoning; fallacies of reasoning; experience in various forms of formal argument, and evaluation systems. 4 lectures. Prerequisite: SPC 201 or SPC 202, SPC 125 or ENGL 125 or PHIL 125.

**SPC 330 Classical Rhetorical Theory (4)**

GEB C.3.

Early development of rhetorical theory in Greco-Roman civilization; analysis of the canons of rhetoric; rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: ENGL 215.

**SPC 331 Contemporary Rhetorical Theory (4)**

Contemporary concepts of rhetoric. Contributions of Burke, Weaver, Richards, Toulmin and McLuhan. Issues: Ethics and communication, mass media, freedom of speech and dramatic theory. 4 lectures. Prerequisite: ENGL 215.

**SPC 350 Advanced Forensic Activity (2)**

Upper division participation in intercollegiate forensics. Administration and operation of tournaments held annually on campus and in the community. May be repeated to 6 units. 2 activities. Prerequisite: SPC 250.

**SPC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**SPC 404 Communication in Children's Environments (4)**

Exploration of communication development, preschool and elementary school children; construction, presentation, and evaluation of appropriate instructional experiences; student-teacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures.

**SPC 405 Interpreters Theatre (3)**

Examination of modes of group performance of literature; scripting, directing, performing and critiquing through Readers Theatre, Chamber Theatre and Story Theatre. 3 lectures. Prerequisite: SPC 305, or consent of instructor.



**SPC 411 Communication Research (4)**

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: STAT 211, SPC 312.

**SPC 412 Organizational Communication (3)**

Relationships of human behavioral dynamics within the organizational process. Functions of information networks in organizations. Role of leadership in the business-industrial context. 3 lectures. Prerequisite: Junior standing.

**SPC 430 Rhetorical Criticism (4)**

Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures. Prerequisite: SPC 330 or consent of instructor.

**SPC 435 Great Speeches (4)**

Selected speakers and speeches from the Greco-Roman era to the present. Analysis and discussion of oratory's role in the shaping of historical events and the development of civilization. 4 lectures. Prerequisite: SPC 430 or consent of instructor.

**SPC 450 Internship: Speech Communication (2-4) (CR/NC)**

Supervised practicum and application of principles and theories of speech communication in organizational settings. Credit/No Credit grading. Prerequisite: Junior standing, 2.5 GPA, and department head approval.

**SPC 460 Undergraduate Seminar (1)**

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Junior standing.

**SPC 461 Senior Project (3)**

Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time. Prerequisite: SPC 460.

**SPC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SPC 503 Psycholinguistic Disabilities (3)**

Identification, evaluation, and treatment of various types of language disorders including semantic, syntactic and pragmatic disabilities affecting both oral and written language processes. Organic, environmental, and emotional factors are stressed. 3 seminars. Prerequisite: SPC 303.

**SS—SOIL SCIENCE****SS 100 Orientation in Soil Science (1)**

Understanding the depth and breadth of the study of soils as a science. Student and professional organizations. 1 lecture.

**SS 121 Soils (4)**

GEB F.2.

Soils study by the analysis of genetic, physical, chemical and biological properties. Interpretation of soils information for agricultural management, proper land use and soil resource conservation. 3 lectures, 1 laboratory.

**SS 122 Soil Management (4)**

Effects of tillage, soil amendments, drainage, water quality, salinity and soil physical properties on agricultural production and land use capability interpretations. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**SS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SS 202 Soil Conservation (3)**

Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. Miscellaneous course fee required—see Class Schedule. 3 lectures. Prerequisite: SS 121 or consent of instructor.

**SS 221 Fertilizers (4)**

Plant nutrient requirements. Composition, value, and use of fertilizer materials, conditioners and agricultural minerals. Methods of manufacturing, distributing, and applying fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**SS 223 Soil Materials (4)**

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

**SS 312 Agricultural Climatology (3)**

Influence of climate, climatic factors and the plant canopy microclimate on plant growth, response and yield. Recognition of potentially detrimental effects of climate on plants and methods used to eliminate or alleviate these effects. 2 lectures, 1 laboratory. Prerequisite: SS 121 and junior standing or consent of instructor.

**SS 321 Soil Classification (4)**

Field study of morphological properties of local soils. Implementation of concepts used in soil taxonomy. Interpretations of soil suitabilities for agronomic and urban uses. Miscellaneous course fee required—see Class Schedule. 2 lectures, 2 laboratories. Prerequisite: SS 121, SS 223 or consent of instructor.

**SS 322 Soil Fertility (3)**

Investigation and evaluation of the nutrient supplying ability of soils. Examination of the conditions and transformations involved in the transfer of mineral nutrients from the soil to the plant. Interpretation of data integrating soils, applied fertilizers and plant growth. 2 lectures, 1 laboratory. Prerequisite: SS 122, SS 221, CHEM 122 or CHEM 128.

**SS 323 Soil Geomorphology (3)**

Identification of major landforms in the Western United States using topographic maps, aerial photographs and soil survey reports. Analyzing the soil distribution and soil formation on these major landforms. 2 lectures, 1 laboratory. Prerequisite: SS 321 or GEOL 201 or consent of instructor.

**SS 333 Tropical Soils (4)**

Nature and properties of soils occurring in the tropics, their origin, morphology, classification, fertility, management and conservation. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

**SS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SS 421 Soil Mapping (2)**

Field study of the techniques used in making a soil map for agricultural, rangeland, forest and urban uses. Practice in the preparation of a soil survey manuscript and field reviews. 1 lecture, 1 laboratory. Prerequisite: SS 321.

**SS 422 Soil Microbiology (3)**

Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 2 lectures, 1 laboratory. Prerequisite: SS 221, BACT 221 or BACT 224, CHEM 328 or consent of instructor.

**SS 423 Soil Chemistry (4)**

Application of concepts in chemistry and clay mineralogy to the management, use and understanding of soils. Quantitative approach to understanding and altering the chemical environment in saline, sodic and acidic soils for optimizing their use. 3 lectures. 1 laboratory. Prerequisite: SS 322, CHEM 129 or consent of instructor.

**SS 431 Soil Taxonomy (2)**

Taxonomic classification for making and interpreting soil surveys. Defining the properties and limits that separate individual soils, and identifying combinations of these properties that can be observed in the field. 2 lectures. Prerequisite: SS 121, SS 321.

**SS 432 Soil Physics (4)**

Fundamentals of soil physical properties: structure, texture, water, air and temperature and their application to agricultural and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 122, PHYS 104 or PHYS 121, CHEM 122, or CHEM 128, or consent of instructor.

**SS 433 Land Use Planning (3)**

Development of plans and practices for management of agricultural, recreational and urban land use by evaluating the soil capabilities through the use of Soil Survey Reports. 2 lectures, 1 laboratory. Prerequisite: SS 202 or consent of instructor.

**SS 440 Forest and Range Soils (4)**

Ecosystem approach to the chemical, biological, physical and mechanical properties of forest and range soils. Interpretation of specific research findings and their applications to management problems. Preparation of soil management reports similar to those required by various land management organizations. 3 lectures; 1 laboratory. Prerequisite: SS 121.

**SS 461 Senior Project (1)**

Senior project topic selection and contract development with project adviser. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information.

**SS 462 Senior Project (4)**

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under adviser supervision. Minimum 120 hours. Prerequisite: SS 461.

**SS 463 Undergraduate Seminar (2)**

Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.

## 500 STAT

### SS 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### SS 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

### SS 508 Conservation Legislation (3)

Legislation enabling and implementing conservation programs. Legal responsibilities of individuals and groups in the development of natural resources. Proposed or needed legislation for more effective conservation. 3 lectures. Prerequisite: Senior or graduate standing.

### SS 521 Soil Morphology (3)

Morphological characteristics and genesis of soils and their relationship with major land-form features. New techniques used in modern systems of soil classification and mapping. 2 lectures, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

### SS 522 Advanced Soil Fertility (3)

Current research frontiers in soil fertility. Evaluating soil testing philosophy, theories and interpretation; optimizing soil conditions for maximizing crop production; consequences of environmental pollution, trace elements and organic amendments; chemical reactions including solubility and chelate equilibria, adsorption phenomena, nutrient mobility, soil mineralogy and weathering; use of foliar fertilization; and radioisotopes in soil fertility. 3 lectures. Prerequisite: SS 322, graduate standing or consent of instructor.

### SS 581 Graduate Seminar in Soils (3)

Current research, experiments and problems related to soil science. 3 seminars.

### SS 582 Advanced Land Management (3)

Development of plans and practices for the management of crop, range, and wood land. 2 seminars, 1 laboratory. Prerequisite: Graduate standing, SS 433, CRSC 411 or equivalent.

## STAT—STATISTICS

### STAT 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### STAT 211 Elementary Probability and Statistics (3)

GEB B.2.

Classification of statistical data; calculation and uses of various averages; measures of variability; elementary probability; binomial and normal distributions; random sampling, confidence intervals, introduction to hypothesis testing. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

### STAT 212 Statistical Methods (3)

GEB B.2.

Tests of hypotheses, and confidence intervals on common parameters; linear regression and correlation; multiple regression; analysis of variance; analysis of enumerative data; nonparametric methods. 3 lectures. Prerequisite: STAT 211.

### STAT 251 Statistical Inference for Management I (3)

GEB B.2.

Descriptive statistics. Review of probability distributions. Point and interval estimation of common population parameters. Hypothesis tests of population means, proportions, and variances. Chi-square analysis. Use of calculators and minitab as computing tool. 3 lectures. Prerequisite: MATH 121.

**STAT 252 Statistical Inference for Management II (3)**

GEB B.2.

Regression, correlation, multiple regression, time series, and forecasting. Use of computers, batch and terminal, assumed throughout course. Experience with large statistical computer packages in analyzing information in data-bases. 3 lectures. Prerequisite: STAT 251 and CSC 120 or one course in computer programming.

**STAT 313 Design and Analysis of Experiments (3)**

Applications of statistics for students not majoring in statistics or mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Use of computer software in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212.

**STAT 321, 322 Statistical Analysis (3) (3)**

321: GEB B.2.

Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation, introduction to analysis of variance, analysis of covariance, distribution free procedures. Use of computing facilities in the solution of statistical problems. 3 lectures. Prerequisite: MATH 132 or MATH 142.

**STAT 323 Analysis of Variance (3)**

Single and two factor analyses of variance, fixed and random effects, Latin square and other special designs, nested designs, factorial designs and analysis of  $2n$  factorial experiments, analysis of covariance. 3 lectures. Prerequisite: STAT 322.

**STAT 324 Applied Regression Analysis (3)**

Simple linear regression, aptness of model, special topics in simple linear regression, multiple linear regression, indicator variables, selection of "best subset," and introduction to nonlinear regression models. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322.

**STAT 330 Statistical Uses of Computers (3)**

Techniques available to the statistician for efficient use of a digital computer to perform statistical computations and to handle large amounts of data. Use of special languages. Analysis of computer software used in the solution of statistical problems. 3 lectures. Prerequisite: STAT 322, one course in computer programming.

**STAT 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: Consent of department head.

**STAT 415 Nonparametric Methods in Statistics (3)**

Hypothesis testing when the form of the parent population is unknown; tests based on Binomial Distribution; measures of dependence; contingency tables; tests based on ranks; Kolmogorov-Smirnov-type tests. 3 lectures. Prerequisite: STAT 212 or STAT 322.

**STAT 418 Topics in Multivariate Statistics (3)**

Either discrete or continuous multivariate statistics. Discrete multivariate statistics includes analysis of multidimensional contingency tables, log-linear and logit models, goodness of fit statistics, model building and hypothesis testing. Continuous multivariate statistics includes multivariate linear model, principal components and factor analysis, discriminate analysis, clustering and canonical correlation. Course may be taken twice for credit with permission of instructor. 3 lectures. Prerequisite: Two courses in statistics and MATH 204 or the consent of instructor.

**STAT 421 Sampling Techniques (3)**

Planning, execution, and analysis of sampling from finite populations. Sampling designs and estimation procedures. Nonsampling errors. Questionnaire analysis. Case studies. 3 lectures. Prerequisite: STAT 212, STAT 252, or STAT 322.

**STAT 423 Linear Models (3)**

General linear model—a unified approach to various applied methods. Regression, t-test, analysis of variance and covariance; programming statistical problems. Advanced topics in statistical designs; split plot design, confounding, fractional factorial, response surfaces. 3 lectures. Prerequisite: STAT 323, MATH 204.

**STAT 425 Probability Theory and Applications I (3)**

GEB B.2.

Basic probability theory, conditional and marginal probability, stochastic independence, probability models for random phenomena, probability distributions, mathematical expectation and transformation. 3 lectures. Prerequisite: STAT 321, MATH 241.

**STAT 426 Probability Theory and Applications II (3)**

Multivariate normal distribution, sampling distributions, theory of estimation and hypothesis testing. 3 lectures. Prerequisite: STAT 425.

**STAT 427 Mathematical Statistics (3)**

Investigation of statistical theory, including the topics of Bayesian inference, regression and linear hypotheses, and sequential analyses. 3 lectures. Prerequisite: STAT 426.

**STAT 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**STAT 463 Undergraduate Seminar (2) (CR/NC)**

Reports and discussions by students through seminar methods, based on topics of interest to persons preparing for a career in statistics. Offered only on a Credit/No Credit basis. 2 seminars.

**STAT 470 Selected Advanced Topics (1–3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**STAT 512 Statistical Methods (3)**

Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation. Application of statistics in the student's major field. 3 seminars. Prerequisite: Intermediate algebra or equivalent.

**TH—THEATRE****TH 220 Introduction to Theatre (3)**

GEB C.2.

Play production process, current and historical, including theatrical terminology, methods, aesthetics and technology. 3 lectures.

**TH 320 Acting (3)**

Basic acting techniques, improvisation, characterization, pantomime and movement. 3 lectures. Prerequisite: TH 220 or consent of instructor.

**TH 321 Directing (3)**

Script analysis, motivation and blocking of action, preparation of the prompt book. Direction of practice scenes. 2 lectures, 1 two-hour laboratory. Prerequisite: TH 220.

**TH 322 Stagecraft (2)**

Scenery design, construction, painting, lighting, costumes, and make-up. 2 two-hour laboratories. Maximum of 6 units may be earned. Prerequisite: TH 220 or consent of instructor.

**TH 327, 328 Theatre History and Literature (3) (3)**

GEB C.3.

History of the theatre and correlated studies of representative plays from 500 B.C. to 1660 A.D., and from 1660 A.D. to present. 3 lectures. Prerequisite: TH 220 or consent of instructor.

**TH 331 Rehearsal and Performance (2)**

Preparation of a play for public presentation, including acting, stage management, publicity and house management. Admission to course by audition only. Maximum of 6 units credit may be earned. 2 laboratories.

**TH 347 Children's Drama (3)**

Role-playing, group dramatization, and related activities. For students preparing to teach. 1 lecture, 2 two-hour laboratories.

**TH 422 Stage Design: Scenery, Costume, Lighting (3)**

Theories and contemporary practices in stage, film, TV, dance, concert design. Script, character, production concept through elevations, renderings, models, plots, equipment lists, cue sheets. Portfolio preparation and presentation. May be repeated to 9 units. 3 lectures. Prerequisite: TH 322 or consent of instructor.

**TH 450 Theatre Management (3)**

Organization and operation of the regional, community or educational theatre company from staffing, program selection, publicity, house and box office operation, budgeting and contracts, art center participation. 3 lectures. Prerequisite: Consent of instructor.

**TH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**VGSC—VEGETABLE SCIENCE****VGSC 230 General Vegetable Crops (4)**

GEB F.2.

Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry for other than crop science majors. Credit not allowed for both VGSC 230 and VGSC 232. 3 lectures, 1 laboratory.

**VGSC 232 Vegetable Crops Production (4)**

Production, adaptation, utilization of vegetable crops such as cole crops, beans, celery, peppers, squash, melons, cucumbers, lettuce, carrots, spinach, sweet potatoes. Field trip to a major California vegetable production area required. Credit not allowed for both VGSC 230 and VGSC 232. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

**VGSC 250 Home Vegetable Production (2)**

Practical aspects of growing vegetable crops in the home garden. Seedbed preparation, mulching, composting, transplanting, seeding, irrigation, fertilization and cultural practices utilized in production of vegetable crops. 1 lecture, 1 laboratory.

**VGSC 324 Harvesting and Packaging Vegetable Crops (4)**

Harvesting methods and procedures; current handling and packaging techniques; containers; precooling and refrigerated storage; post harvest physiology of fresh market vegetables. Field trip to a major California vegetable production, area required plus local grower visits. 3 lectures, 1 laboratory. Prerequisite: VGSC 232 or consent of instructor.

**VGSC 326 Advanced Vegetable Production (4)**

Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. Field trip to a major California vegetable production area required. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

**VGSC 424 Vegetable Crop Management (4)**

Organization, management, and operation of commercial vegetable production considering the varied aspects of the entire commercial vegetable industry. Field trip to a major California vegetable production area required. 3 lectures, 1 laboratory. Prerequisite: VGSC 326 or consent of instructor.

**VGSC 521 Advanced Vegetable Science (4)**

Advanced study of vegetable science. Special study projects. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**VS—VETERINARY SCIENCE****VS 099 Principles of Veterinary Science (5)**

Structural aspects and functions of the principal systems of farm animals, control and prevention of common diseases causing economic losses in livestock. 4 lectures, 1 laboratory. To be taken by technical students only, in substitution for VS 123, 302 and 203. Not open to degree students for degree credit. Prerequisite: BIO 099 or 101.

**VS 123 Anatomy and Physiology (3)**

Structural aspects and the normal functions of the principal systems of the various farm animals. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

**VS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**VS 203 Animal Parasitology (3)**

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: ZOO 131.

**VS 302 Animal Hygiene (3)**

Basic disease concepts, transmission of infectious diseases, fundamentals of immunology. Infectious disease preventive principles. The livestock producer's role and responsibilities in governmental farm animal disease control programs. 3 lectures. Prerequisite: BACT 221.

**VS 310 Zoonosis (2)**

Significant public health diseases transmissible to man through domestic and wild animals, vectors, and food resources. 2 lectures. Prerequisite: ZOO 131 or BIO 101.

**VS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**VS 438 Systemic Animal Physiology (4)**

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: VS 123, CHEM 328.

**ZOO—ZOOLOGY****ZOO 131 General Zoology (4)**

GEB B.1.b.

Cells, tissues, and organ systems of vertebrates; emphasis on man and domestic animals. 2 lectures, 2 laboratories.

**ZOO 132 General Zoology (4)**

GEB B.1.b.

Embryology, genetics, taxonomy, economic zoology, ecology and evolution. 2 lectures, 2 laboratories. Prerequisite: ZOO 131.

**ZOO 133 General Zoology (4)**

Variety, structure and distribution of invertebrate animals. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.



**ZOO 237 Human Anatomy (3)**

Structure of the human body as the basis of function. Supplemented with demonstrations of human cadavers. Not open for Anatomy and Physiology Concentration credit to students who have completed ZOO 326. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

**ZOO 238, 239 Human Physiology (3) (3)**

Function of various organ systems of man with appropriate laboratory experiments. Not open for Anatomy and Physiology Concentration credit to students who have completed ZOO 432 or 433. 2 lectures, 1 laboratory. Prerequisite: ZOO 131 and elementary chemistry.

**ZOO 303 Vertebrate Embryology (3)**

GEB B.1.b.

Developmental processes from the egg to the formation of the body and the establishment of the principal organs and systems. 3 lectures. Prerequisite: ZOO 132.

**ZOO 304 Vertebrate Embryology Laboratory (2)**

Developmental anatomy of selected stages of the frog, chicken and pig. Demonstrations and exercises in the preparation of embryonic materials for study purposes. 2 laboratories. Prerequisite: ZOO 303 (may be taken concurrently).

**ZOO 321 Mammalogy (4)**

GEB B.1.b.

Identification, biology and economic importance of mammals, with special reference to California species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132 or BIO 129.

**ZOO 322 Ichthyology (4)**

GEB B.1.b.

Identification, physiology, anatomy, and behavior of marine and freshwater fishes with special reference to local and economically important species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 323 Ornithology (4)**

GEB B.1.b.

Classification, anatomy and physiology, ecology and behavior, and economic importance of birds. Four Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: ZOO 132 or BIO 129.

**ZOO 324 Zoo Biology (3)**

Wild animals in captivity; principles and problems of maintaining them for recreational, educational and scientific purposes. 3 lectures. Prerequisite: One year of biology or zoology.

**ZOO 326 Comparative Anatomy of the Vertebrates (5)**

GEB B.1.b.

Comparative structure of vertebrate organ systems. 3 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 329 Vertebrate Field Zoology (4)**

GEB B.1.b.

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132 or BIO 129.

**ZOO 336 Invertebrate Zoology (4)**

Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution and economic importance. 2 lectures, 2 laboratories, and field work. Prerequisite: ZOO 133 or BIO 129.

**ZOO 340 Human Muscle Anatomy (2)**

Muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite: ZOO 237 (may be taken concurrently).

**ZOO 341 Herpetology (4)**

GEB B.1.b.

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 356 Neurobiology (3)**

Survey of the nervous system with emphasis on functional anatomy of the human brain. Motor and sensory systems. Neural control mechanisms, including neurotransmitters and neuromodulators. Development, aging, and common disorders. 3 lectures. Prerequisite: ZOO 131.

**ZOO 412 Introduction to Clinical Pathology (3)**

Malignant, deficiency, degenerative and other noninfectious diseases from the standpoint of etiology, manifestations and laboratory findings. 3 lectures. Prerequisite: CHEM 328, ZOO 239 or BIO 431.

**ZOO 422 Histology (4)**

Functional microscopic anatomy of principal tissues and organs of vertebrates. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 425 Parasitology (4)**

External and internal parasites of man and animals; life history; parasite-host relationships; control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: ZOO 132. Recommended: ZOO 133.

**ZOO 426 Serology and Immunology (4)**

Nature of innate and acquired immune reactions: theory and techniques of serological methods in diagnosing disease. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor.

**ZOO 428 Hematology (4)**

Formation, composition, function and destruction of blood in health and disease. Methods for examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: ZOO 131 and consent of instructor. Recommended: ZOO 426.

**ZOO 432 Physiology II: Comparative Systems (4)**

Physiological mechanisms involved in osmotic and ionic regulations, digestion, circulation, respiratory energetics and thermal acclimation. Laboratory experiments in physiological processes and their ecological importance. 2 lectures, 2 laboratories. Prerequisite: BIO 431.

**ZOO 433 Physiology III: Endocrine and Reproductive (4)**

Introduction to the endocrine and reproductive systems of vertebrate animals. Includes not only classical actions of hormones but also mechanisms of hormone action, relationship between nervous and endocrine systems, hormone bioassay, and selected clinical aspects of endocrinology. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 and BIO 431.

**ZOO 437 Animal Behavior (4)**

Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 (BIO 315 and 325 recommended).

**ZOO 524 Functional Vertebrate Morphology (3)**

Analysis of locomotor and feeding mechanisms. 2 seminars, 1 laboratory. Prerequisite: Graduate standing.

**ZOO 530 Behavioral Ecology (3)**

Function and evolution of behavioral phenomena as they relate to ecological phenomena. Topics include: habitat selection; spacing mechanisms; reproductive strategies; feeding strategies; agonistic, parasitic, and altruistic behavior; migration; and comparative social systems. 3 seminars. Prerequisite: Graduate standing, BIO 325 or BOT 326, ZOO 437. Recommended: BIO 315, PSY 304.

# Directories

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CALIFORNIA POLYTECHNIC STATE UNIVERSITY  
SAN LUIS OBISPO

San Luis Obispo, CA 93407  
(805) 546-0111

OFFICE OF THE PRESIDENT

President .....	Warren J. Baker
Administrative Assistant .....	Grace Arvidson
Associate Executive Vice President .....	Howard West
Executive Assistant to the President .....	Larry R. Voss
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Provost .....	Tomlinson Fort, Jr.

PROVOST-ACADEMIC AFFAIRS

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Director, Extended Education .....	Howard M. Vollmer
Director, Institutional Research .....	Lowell H. Dunigan
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Registrar .....	Gerald N. Panches
Associate Provost for Information Systems .....	Emile E. Attala (Interim)
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Director, Computer Aided Productivity Center .....	Mark A. Cooper (Interim)
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Assistant Director .....	Charles R. Beymer
Assistant Director .....	Angelina Matinez
Assistant to Director .....	Lynne E. Gamble
Director, Audiovisual .....	John Heinz

# INSTRUCTION

Dean, School of Agriculture and Natural Resources .....	Lark P. Carter
Associate Dean.....	Larry P. Rathbun
Associate Dean.....	John W. West
Dean, School of Architecture and Environmental Design ..	Kenneth E. Schwartz (Interim)
Associate Dean.....	K. Richard Zweifel (Interim)
Dean, School of Business .....	Kenneth D. Walters
Associate Dean.....	M. Zafar Iqbal
Dean, School of Communicative Arts and Humanities .....	Jon M. Ericson
Associate Dean.....	Thomas V. Johnston
Dean, School of Engineering and Technology .....	William F. Horton (Interim)
Associate Dean.....	Gustav N. Wassel (Interim)
Dean, School of Human Development and Education .....	Harry J. Busselen, Jr. (Interim)
Associate Dean.....	Position Vacant
Dean, School of Science and Mathematics .....	Philip S. Bailey (Interim)
Associate Dean.....	Harry L. Fierstine (Interim)

# BUSINESS AFFAIRS

Director, Business Affairs.....	James R. Landreth
Associate Director, Business Affairs.....	Position Vacant
Budget Officer .....	Richard H. Ramirez
Director, Public Safety .....	Richard C. Brug
Financial Manager .....	Anthony B. Flores
Housing Manager .....	Joseph C. Risser
Procurement and Support Services Officer .....	Ray Macias

# PERSONNEL AND EMPLOYEE RELATIONS

Director .....	Janet L. Pieper
Faculty Personnel Analyst .....	Michael H. Suess
Staff Personnel Officer .....	Robert M. Negranti

# FACILITIES PLANNING AND OPERATIONS

Executive Dean .....	E. Douglas Gerard
Director, Plant Operations .....	Edward M. Naretto

# STUDENT AFFAIRS

Dean of Students.....	Russell H. Brown
Associate Dean, Student Affairs .....	Lorraine H. Howard
Associate Dean, Student Affairs and Director, Judicial Affairs.....	W. Carl Wallace
Assistant Dean, Student Affairs .....	Barbara Andre
Director, Activities Planning .....	Kenneth B. Barclay
Coordinator, Greek Affairs.....	Walter M. Lambert
Coordinator, Recreational Sports .....	Marci Snodgrass
Director, Counseling and Testing.....	Kerry T. Yamada
Coordinator, Learning Assistance Center .....	Patricia A. Stewart
Director, Student Academic Services.....	Armando A. Pezo-Silva
Coordinator, Disabled Student Services .....	Harriet Clendenen
Director, Financial Aid .....	Lawrence J. Wolf
Director, Health Services .....	James H. Nash, M.D.
Director, Housing.....	Robert M. Bostrom
Director, Placement Center .....	Richard M. Equinoa

## FOUNDATION

Executive Director .....	Alfred W. Amaral
Assistant to the Director .....	Robert E. Griffin
Controller .....	James A. Neal
Director, Communications/Media Productions .....	Eduardo A. Apodaca
Director, Food Service .....	Everette E. Dorrrough
Manager, Accounting .....	Donna Fritz
Manager, Data Processing .....	Neal Feaver
Manager, El Corral Bookstore .....	Ivan L. Sanderson
Sponsored Programs Administrator .....	Thomas C. Davis

## UNIVERSITY RELATIONS

Vice President for University Relations .....	James L. Strom
Director, Development .....	Carroll D. Price, II
Assistant to the Director .....	Darlene Slack
Annual Giving Officer .....	Stan Halpern
Director, Athletic Development .....	Denny Martindale
Director, Public Affairs .....	Stan Bernstein
Public Affairs Officer .....	Donald L. McCaleb
University Editor .....	Robert Anderson
Director, Alumni Relations .....	B. Robert Timone (Interim)

## ASSOCIATED STUDENTS, INC.

Director, A.S.I. Business Affairs .....	Stephen H. Adams (Interim)
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## DEPARTMENT HEADS

### SCHOOL OF AGRICULTURE AND NATURAL RESOURCES

Agricultural Education .....	Joseph E. Sabol (Interim)
Agricultural Engineering .....	Edgar J. Carnegie
Agricultural Management .....	M. LeRoy Davis
Animal and Veterinary Science .....	Richard J. Birkett (Interim)
Crop Science .....	Corwin M. Johnson
Dairy Science .....	Eugene E. Starkey
Food Science .....	Robert D. Vance
Natural Resources Management .....	Norman H. Pillsbury (Interim)
Ornamental Horticulture .....	Ronald D. Regan
Poultry .....	Philip L. Potts, Sr.
Soil Science .....	Brent G. Hallock (Interim)

### SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Architectural Engineering .....	David S. Hatcher
Architecture .....	Donald J. Koberg (Interim)
City and Regional Planning .....	William A. Howard
Construction Management .....	David R. Pierce, Jr.
Landscape Architecture .....	Gerald L. Smith

### SCHOOL OF BUSINESS

Accounting .....	Richard J. Schmidt
Business Administration .....	Walter W. Perlick
Economics .....	George M. Eastham
Management .....	Robert H. McIntire

### SCHOOL OF COMMUNICATIVE ARTS AND HUMANITIES

Art .....	Barbara Young
English.....	Brent H. Keetch (Interim)
Foreign Languages .....	William T. Little
Graphic Communications .....	Harvey R. Levenson
History .....	Robert E. Burton
Journalism.....	Randall L. Murray
Music .....	Bessie R. Swanson
Philosophy .....	Kendrick W. Walker
Political Science.....	Randal L. Cruikshanks
Social Sciences .....	Position Vacant
Speech Communication .....	Harry W. Sharp, Jr.

### SCHOOL OF ENGINEERING AND TECHNOLOGY

Aeronautical and Mechanical Engineering .....	Raymond G. Gordon
Civil Engineering and Environmental Engineering.....	Peter Y. Lee
Electronic and Electrical Engineering .....	James G. Harris
Engineering Technology .....	William R. Backer
Industrial Engineering.....	Donald E. Morgan
Industrial Technology .....	Laurence F. Talbott
Metallurgical and Welding Engineering .....	George T. Murray (Interim)

### SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Child Development and Home Economics .....	Frances J. Parker
Education .....	Richard L. Warren
Ethnic Studies, Coordinator .....	David J. Sanchez
Liberal Studies, Coordinator .....	John B. Connely
Physical Education and Recreation Administration .....	Jimmy H. Railey
Psychology .....	Charles M. Slem (Interim)

### SCHOOL OF SCIENCE AND MATHEMATICS

Biological Sciences .....	V. L. Holland
Chemistry .....	William C. Rife
Computer Science and Statistics .....	Neil W. Webre (Interim)
Mathematics .....	Paul F. Murphy (Interim)
Military Science.....	Lt. Col. Richard L. Jones
Physics.....	Keith S. Stowe (Interim)

### INTERCOLLEGIATE ATHLETICS

Director .....	Richard Heaton
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## FACULTY EMERITI

(Dates indicate period of service)

Robert E. Kennedy (1940-1979)	President Emeritus
* * * * *	
Robert W. Adamson (1953-1983)	Aeronautical and Mechanical Engineering
John K. Allen (1952-1970)	Veterinary Science
Anthony J. Amato (1955-1982)	Ornamental Horticulture
Elizabeth B. Anderson (1958-1980)	English
Olive M. Andersen (1957-1972)	Mathematics
Richard A. Anderson (1947-1983)	Physical Education
Roy E. Anderson (1949-1978)	Business
Warren R. Anderson (1946-1979)	Electronic and Electrical Engineering
Robert L. Andreini (1954-1983)	Speech Communication
Dale W. Andrews (1950-1983)	Executive Vice President
John H. Applegarth (1952-1972)	Biological Sciences
William W. Armentrout (1953-1980)	Education
James H. Babb (1959-1982)	Graphic Communications
Roger S. Bailey (1962-1979)	Art
Stanley L. Barr (1959-1980)	English
George C. Beatie (1959-1980)	Music
Lyman L. Bennion (1938-1967)	Animal Husbandry
Joy G. Berghell (1956-1975)	Library
Ellard W. Betz (1947-1976)	Engineering Technology
Ralph O. Bille (1948-1965)	Agricultural Engineering
Chester O. Bishop (1957-1973)	Mechanical Engineering
Emmett A. Bloom (1946-1974)	Animal Science
Enrico P. Bongio (1948-1979)	Engineering Technology
Robert O. Boothe (1954-1972)	Foreign Languages
Woodford E. Bowls (1937-1973)	Physics
William M. Boyce (1962-1978)	Management
Gene E. Brendlin (1950-1971)	Farm Management and Cal Poly Foundation
J. Philip Bromley (1947-1973)	Agricultural Management
Howard C. Brown (1943-1983)	Ornamental Horticulture
Marvin D. Brown (1956-1963 and 1964-1976)	English
Athol J. D. Brunk (1957-1980)	Physics
L. LaVerne Bucy (1955-1978)	Animal Science
H. H. Burlingham (1948-1972)	Agricultural Education
William O. Buschman (1956-1980)	Computer Science and Statistics
Arthur G. Butzbach (1950-1970)	Education
Tracey G. Call (1962-1980)	Biological Sciences
Laurence H. Carr (1963-1980)	Engineering Technology
James H. Carrington (1943-1967)	Agricultural Engineering
Logan S. Carter (1947-1970)	Soil Science
Marjorie Cass (1957-1974)	Education
Everett M. Chandler (1951-1977)	Student Affairs
Daniel C. Chase (1954-1979)	Agricultural Management
Robert L. Cleath (1965 and 1968-1980)	Speech Communication
Ralph C. Collins (1955-1974)	Education
Spelman B. Collins (1940-1968)	Animal Husbandry
David W. Cook (1941-1977)	Mathematics and Academic Affairs
Frank G. Coyes (1965-1983)	Agricultural Engineering
A. Norman Cruikshanks (1947-1971)	Social Sciences
James T. Culbertson (1953-1977)	Philosophy
Carl C. Cummins (1958-1983)	Dean of Communicative Arts and Humanities
Charles P. Davis (1958-1983)	Civil and Environmental Engineering
Arnold M. Dean (1949-1982)	Soil Science



Bruce A. Dickson (1952-1978)	Soil Science
Ralph W. Dilts (1944-1973)	History
John E. Dunn, Sr. (1961-1981)	Agricultural Engineering
Wesley T. Dunn (1959-1974)	Graphic Communications
Walter E. Elliott (1965-1983)	Physics
Charles A. Elston (1947-1973)	Mathematics
Edward J. Ernatt (1958-1983)	Education
Oswald J. Falkenstein (1953-1977)	Mathematics
Warren S. Farrell (1967-1981)	Agricultural Management
Harry C. Finch (1962-1980)	Biological Sciences
Millard J. Forter (1954-1976)	Industrial Engineering
Anne C. Fowler (1965-1982)	Social Science
Clara B. Froggatt (1964-1980)	Counseling and Testing
Robert H. Frost (1953-1983)	Physics
George S. Furimsky (1955-1973)	Engineering Technology
Vincent J. Gates (1958-1977)	Journalism
Curtis F. Gerald (1964-1980)	Computer Science and Statistics
J. Corder Gibson (1949-1976)	Agricultural Education and Dean of Agriculture and Natural Resources
Marcus Gold (1947-1952 and 1954-1980)	Audiovisual
James R. Golden (1967-1983)	Industrial Engineering
David M. Grant (1950-1980)	English and Academic Affairs
Rufus L. Graves, Jr. (1951-1954 and 1957-1982)	Architecture
C. Herold Gregory (1950-1970)	Printing Technology and Management
Lester W. Gustafson (1947-1971)	Aeronautical Engineering
Richard E. Hall (1946-1977)	Engineering Technology
Charles J. Hanks (1954-1983)	Mathematics
Reino Hannula (1962-1981)	Computer Science and Statistics
John R. Healey (1947-1980)	Journalism
Anatol Helman (1957-1974)	Architecture
Harold J. Hendriks (1952-1978)	Electronic and Electrical Engineering
Charles A. Herald (1958-1975)	Electronic and Electrical Engineering
Earl R. Hesch (1956-1983)	Engineering Technology
William R. Hicks (1957-1983)	Physical Education
George E. Hoffman (1956-1979)	Industrial Engineering
Wilbur C. Hogan (1959-1973)	Philosophy
Ray J. Holt (1955-1978)	Physics
Walter E. Holtz (1954-1966 and 1968-1982)	Environmental Engineering
Gilbert L. Homfeld (1960-1976)	Mathematics
H. Clyde Hostetter (1958-1983)	Journalism
A. L. Houk (1946-1972)	Chemistry
Ernest R. Houston (1957-1983)	Ornamental Horticulture
LeRoy B. Hughes (1950-1971)	Physical Education
Edgar A. Hyer (1951-1981)	Agricultural Management
James J. Jensen (1948-1973)	Physical Education
Mead R. Johnson (1956-1980)	English
Miles B. Johnson (1957-1983)	English
Robert M. Johnston (1946-1954 and 1956-1974)	Engineering Technology
Edward J. Jorgensen (1947-1976)	Physical Education
William B. Judd (1956-1981)	Mathematics
Herbert R. Kabat (1952-1983)	Physics
Roger A. Keech (1965-1983)	Aeronautical and Mechanical Engineering
Paul Kenyon (1957-1982)	Business Administration
Richard T. Kombrink (1956-1980)	Engineering Technology
Russell Korsmeyer (1958-1978)	Electronic and Electrical Engineering
William E. Krupp (1965-1980)	Engineering Technology
Alexander N. Landyshev (1956-1972)	Electronic and Electrical Engineering

James A. Langford (1955-1976)	Education
Paul S. Lansman (1964-1979)	Mathematics
George Laumann (1957-1980)	Mathematics
John D. Lawson (1951-1978)	Activities Planning
Richard I. Leach (1930-1971)	Poultry Industry
Vance D. Lewis (1946-1972)	Physics and School of Science and Mathematics
Charles H. Lindamood (1958-1979)	English
Willard H. Loper (1955-1983)	Agricultural Engineering
Bernice B. Loughran (1958-1980)	Art
Leon W. Magur (1958-1983)	Physics
Ena L. Marston (1946-1970)	English
Theodore Matthew (1948-1962)	Chemistry
Scott J. Maughan (1965-1980)	History
James M. McGrath (1946-1975)	Engineering Technology
George H. McMeen (1960-1977)	Mathematics
Mac McRobbie (1962-1979)	Industrial Technology
John L. Merriam (1958-1978)	Agricultural Engineering
Thomas O. Meyer (1955-1979)	Food Science
Allen D. Miller (1960-1983)	Mathematics
John H. Mott (1967-1983)	English
Robert A. Mott (1946-1978)	Physical Education
Billy W. Mounts (1956-1977)	Health Center Physician and Surgeon
Loren L. Nicholson (1956-1979)	Journalism
Dell O. Nickell (1964-1980)	Architectural Engineering
Glenn A. Noble (1947-1973)	Biological Sciences
Thomas F. Nolan (1949-1974)	Political Science
Howard R. O'Daniels (1938-1971)	Business Administration
Michael J. O'Leary (1951-1982)	Social Science
Leon F. Osteyee (1957-1983)	Aeronautical and Mechanical Engineering
Philip H. Overmeyer (1958-1972)	Business Administration
Evelyn I. Pellaton (1966-1982)	Physical Education
James M. Peters (1958-1980)	Chemistry
Richard A. Pimentel (1952-1983)	Biological Sciences
Clifford J. Price (1956-1974)	Aeronautical Engineering
John B. Rapp (1959-1979)	Mechanical Engineering
Evelyn D. Reagan (1946-1948 and 1954-1977)	Library
Oscar E. Reece (1956-1973)	Crop Science
R. Howell Reece (1946-1964)	Mechanical Engineering
R. Wallace Reynolds (1953-1979)	Engineering Technology
Howard Rhoads (1956-1983)	Crop Science
Glenn W. Rich (1953-1979)	Agricultural Engineering
Carlos C. Richards (1946-1971)	Engineering Technology
Torleif M. Rickansrud (1944-1969)	Physics
Rol W. Rider (1960-1982)	Business Administration
Eugene A. Rittenhouse (1949-1976)	Economics and Placement
Leo E. Rogers (1954-1978)	Engineering Technology
Leo E. Sankoff (1942 and 1946-1980)	Agricultural Education
Harry H. Scales (1958-1976)	Education
Paul E. Scheffer (1964-1983)	Industrial Engineering
Walter P. Schroeder (1957-1980)	Education
Chester H. Scott (1952-1978)	Mathematics
Glenn E. Seeber (1954-1979)	Engineering Technology
Owen L. Servatius (1947-1983)	Management
Vard M. Shepard (1932-1960)	Animal Husbandry and Dean of Agriculture
Orien W. Simmons (1961-1980)	Metallurgical and Welding Engineering
Howard F. Smith (1968-1983)	Economics
J. Murray Smith (1960-1981)	Speech Communication

M. Eugene Smith (1946-1974)	History
Warren T. Smith (1952-1973)	Dean of Agriculture
L. Robert Sorensen (1966-1983)	Psychology
Ruth G. Spencer (1967-1982)	Library
Fred H. Steuck (1947-1978)	Electronic and Electrical Engineering
Ellen T. Stookey (1961-1978)	Home Economics
L. Harry Strauss (1961-1976)	Library
John S. Stuart (1964-1983)	Architecture
David H. Thomson (1946-1979)	Biological Sciences
Frank P. Thrasher (1963-1980)	Crop Science
Harmon B. Toone (1952-1977)	Dairy and Poultry Science
Dean Trembly (1961-1976)	Counseling and Testing
William R. Troutner (1942-1976)	Crop Science
Pearl Turner (1951-1974)	Library
Robert G. Valpey (1972-1983)	Dean of Engineering and Technology
Herman C. Voeltz (1965-1983)	History
Ralph M. Vorhies (1946-1980)	Crop Science
Evelyn K. Voros (1955-1974)	Speech
Isaac N. Walker (1967-1983)	English
Wesley W. Ward (1954-1983)	Architecture
Ralph E. Weston (1948-1967)	Mathematical Sciences
Omer K. Whipple (1956-1976)	Chemistry
Mary Lou White (1961-1979)	Physical Education
Francis F. Whiting (1946-1970)	Engineering Technology
Milo E. Whitson (1947-1974)	Mathematics
J. Barron Wiley (1956-1978)	Education
Richard C. Wiley (1946-1983)	Metallurgical and Welding Engineering
Maurice L. Wilks (1966-1983)	Architecture
Irwin A. Willson (1958-1975)	Education
Harold O. Wilson (1936 and 1946-1974)	Administrative Vice President
C. Paul Winner (1940-1971)	Agricultural Mechanics
Arthur D. Wirshup (1952-1977)	Mathematics
Victor F. Wolcott (1962-1983)	Business Administration
John A. Woodworth (1949-1974)	Mathematics
Lloyd J. Work (1958-1978)	Physics
Dorothy S. Wright (1946-1966)	Library

### DISTINGUISHED TEACHER AWARD RECIPIENTS

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and subsequent recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments since the inception of the program are listed below.

- 1963-64 Robert E. Holmquist, Physics  
John L. Merriam, Agricultural Engineering
- 1964-65 Joy O. Richardson, Mechanical Engineering  
Milo E. Whitson, Mathematics
- 1965-66 A. Norman Cruikshanks, Social Sciences  
Richard F. Johnson, Animal Husbandry  
George R. Mach, Mathematics
- 1966-67 Robert W. Adamson, Mechanical Engineering  
Kenneth G. Fuller, Mathematics  
William D. Curtis, Psychology
- 1967-68 Rodney G. Keif, Environmental Engineering  
David M. Grant, English  
Wesley S. Ward, Architecture

- 1968-69 Robert M. Johnson, Mechanical Engineering  
Bruce Kennelly, Chemistry  
Alice E. Roberts, Education
- 1969-70 Donald W. Hensel, History  
David H. Montgomery, Biological Sciences  
Philip H. Overmeyer, Business Administration  
Willard M. Pederson, English  
Omer K. Whipple, Chemistry
- 1970-71 Robert L. Cleath, Speech  
Kenneth E. Schwartz, Architecture  
Hewitt G. Wight, Chemistry
- 1971-72 Stuart E. Larsen, Aeronautical Engineering  
Barton C. Olsen, History  
Ronald L. Ritschard, Biological Sciences  
Joseph N. Weatherby, Social Sciences
- 1972-73 Lyle G. McNeal, Animal Science  
Charles W. Quinlan, Architecture  
James E. Simmons, English
- 1973-74 William J. Phaklides, Engineering Technology  
Louis D. Pippin, Education  
Duane O. Seaberg, Agricultural Management
- 1974-75 Peter Jankay, Biological Sciences  
Josephine S. Stearns, Child Development  
George J. Suchand, Social Sciences
- 1975-76 James Hayes, Journalism  
William V. Johnson, Music  
Erna Knapp, Art
- 1976-77 Harry L. Fierstine, Biological Sciences  
Grant D. Venerable II, Chemistry  
Ralph M. Warten, Mathematics
- 1977-78 Timothy M. Barnes, History  
Donald P. Grant, Architecture and Environmental Design  
John C. Syer, Political Science
- 1978-79 Pat Pendse, Biological Sciences  
Dane Jones, Chemistry  
Adelaide Harmon-Elliott, Mathematics
- 1979-80 David J. Keil, Biological Sciences  
Thomas Ruehr, Soil Science  
Stephen Weinstein, Mathematics  
Michael D. Zohns, Ornamental Horticulture
- 1980-81 Sarah E. Burroughs, Child Development and Home Economics  
Christina Orr-Cahall, Art  
Kendrick W. Walker, Philosophy
- 1981-82 Christina A. Bailey, Chemistry  
Kenneth E. Ozawa, Physics  
Thomas L. Richards, Biological Sciences
- 1982-83 James Bermann, Agricultural Engineering  
Donald J. Koberg, Architecture  
Jack D. Wilson, Aeronautical and Mechanical Engineering

## STAFF EMERITI

(Dates indicate period of service)

Vic Allen (1951-1976)	Custodial Services
Fern Ballard (1954-1974)	Foundation
Joe C. Baze (1962-1980)	Plant Operations
Gertrude E. Beck (1968-1983)	Activities Planning
James P. Becker (1962-1980)	Plant Operations
Dorothy M. Bishop (1962-1980)	Education
Doris Bodine (1961-1978)	Food Services
Leona M. Boerman (1944-1967)	President's Office
Harold A. Burnett (1962-1977)	Agriculture and Natural Resources
William K. Butts (1965-1980)	Plant Operations
Cyrus E. Casady (1950-1974)	Plant Operations
Orlan Casey (1957-1983)	Plant Operations
George W. Cockriel (1957-1977)	University Police
Loretta I. Costen (1953-1976)	Engineering and Technology
Bernard R. Cox (1968-1983)	Aeronautical and Mechanical Engineering
Richard T. Crosby (1949-1971)	Grounds
Donald J. Curtis (1960-1976)	Health Center
Roy E. Darr (1953-1971)	Plant Operations
Elizabeth D. Dickens (1961-1980)	Architecture and Environmental Design
Lloyd G. Dietrich (1953-1973)	University Police
Paul S. Dillon (1947-1971)	Foundation
Colier Duncan (1955-1977)	Plant Operations
John Dyer (1963-1979)	Plant Operations
Merriam J. Erickson (1962-1980)	Plant Operations
Wilbur T. Erpenbach (1967-1982)	Electronic and Electrical Engineering
Lloyd R. Evans (1959-1978)	Grounds
Mary Eyler (1961-1980)	Financial Aid
Patricia A. Eilers Farrow (1957-1972)	Health Center
Leroy Fauset (1966-1983)	El Corral Bookstore
James Fiscalini (1966-1982)	Farm Shop
Bernard J. Fitzgerald (1958-1980)	Mail Room
Juanita A. Fredericks (1954-1974)	El Corral Bookstore
Helen K. Garing (1966-1983)	Crop Science
Lena Gianolini (1949-1972)	Business Affairs
Gertrude Gladin (1957-1972)	Housing
Ruth Gran (1957-1975)	Health Center
Josephine R. Graves (1964-1982)	Health Center
Margaret Green (1960-1977)	Food Services
Mary Lee Green (1948-1976)	El Corral Bookstore
Joseph C. Hampl (1943-1971)	Foundation
Francine Hapgood (1951-1976)	Business Affairs
Dora L. Harter (1968-1983)	Learning Assistance Center
Florence I. Hauge (1962-1983)	Library
Walter Heffner (1965-1983)	Computer Center
Norma Henderson (1949-1983)	Academic Affairs
C. Milton Hill (1966-1983)	Transportation Services
F. Jerald Holley (1961-1983)	Admissions, Records, and Evaluations
Alicemae Hollings (1966-1982)	Foundation
Lillian R. Hooks (1964-1980)	Library
Catherine S. Hoover (1945-1946) (1962-1983)	Science and Mathematics
Irene R. Horvath (1950-1983)	Communicative Arts and Humanities
Margaret Hoyt (1948-1981)	El Corral Bookstore
Clara Huffman (1959-1974)	El Corral Bookstore
Hazel L. Hunter (1965-1980)	Evaluations
Marie Williams Janolis (1962-1977)	Engineering Technology

Elmer R. Johnson (1966–1982)	Physics
Mary L. Johnson (1950–1976)	Administrative Affairs
Tommie L. Jones (1964–1980)	Business Affairs
Connie Jonte (1961–1983)	Alumni Services
Edwin Koch (1961–1976)	Foundation Custodial
George Lancaster (1962–1979)	Plant Operations
Ronald J. Larsen (1968–1983)	Public Safety
Lois L. Larson (1962–1978)	Health Center
John Lee (1960–1975)	Food Services
Ervin A. Lembcke (1962–1980)	Plant Operations
Wayne Lindsey (1953–1983)	Farm Shop
Joe A. Lipe (1965–1980)	Plant Operations
Ruth Lundquist (1960–1979)	Business Affairs
Josephine E. Maddalena (1965–1980)	Physical Education
James Mapes (1961–1977)	University Police
Anne B. Marcell (1961–1982)	Evaluations
K. Jon Mayeda (1954–1982)	Plant Operations
Daniel H. McCready, Jr. (1961–1983)	Plant Operations
Florence H. Mesler (1962–1983)	Health Center
Julius F. Metz (1968–1983)	Plant Operations
Lionel Middlecamp (1942–1976)	Head Farmer
Viola E. Hughes Milburn (1956–1978)	Health Center
Robert J. Miller (1960–1980)	Business Affairs
Valdora Myers (1960–1978)	Health Center
Harold A. Nash (1947–1974)	Power Plant
Margaret Nelson (1959–1977)	Housing
Avice I. Nolan (1960–1980)	Audiovisual
Edward L. Nolan (1953–1979)	Mechanical Engineering
Lee Owen (1946–1978)	Plant Operations
Kathryn Patterson (1960–1982)	Procurement and Support Services
Alfred J. Pelucca (1956–1971)	Custodial Services
Charles O. Penwell (1946–1971)	Foundation
Joan Roberts (1958–1980)	Foundation
Al Sanders (1964–1979)	Grounds
Edmond L. Schellenger (1966–1983)	Plant Operations
Ralph Schurtz (1949–1973)	Custodial Services
Mary E. Scrivner (1966–1983)	Academic Programs
F. Yvonne Southgate (1963–1980)	Mechanical Engineering
Jean Steck (1960–1975)	Industrial Engineering
Marcie Steger (1962–1979)	Food Services
Mary Jo Summers (1962–1980)	Health Center
Frank Y. Sweeney (1963–1983)	Plant Operations
Arthur A. Thorn (1962–1979)	Business Affairs
Henry VerDoorn (1968–1983)	Plant Operations
Merlin Ward (1946–1974)	Plant Operations
Boyd Wettlaufer (1960–1976)	Audiovisual
Gerald Whiteford (1960–1983)	El Corral Bookstore
Alfred T. Wilcox (1960–1975)	Custodial Services
Margaret Wilmot (1952–1979)	Library
Frank H. Wyman (1956–1972)	Plant Operations
Howard Zaugg (1966–1983)	Plant Operations

## FACULTY AND STAFF

(Number in parentheses indicates year of appointment)

Listed as of May, 1984

- ABITIA, FRED (1969) ..... Cooperative Education  
B.A., San Jose State College, 1964; M.A., 1966; Ed.D., Washington State University, 1971.  
Director.
- ABSHIRE, FRANKLIN P. (1977) ..... Engineering Technology  
B.S., Arizona State University, 1969; M.S., 1974. Professor. Registered Professional Engineer, Arizona, Ohio.
- ACETO, JEANNE C. (1981) ..... Placement Center  
B.A., Whittier College, 1965; M.A., Stanford University, 1966. Student Employment Coordinator.
- ACORD, DORIS (PAT) (1980) ..... Physical Education and Recreation Administration  
B.A., Morehead State, 1961; M.A., Ball State University, 1965; M.A., Southern Illinois University, 1975; Ph.D., 1977. Associate Professor.
- ADALIAN, PAUL T., JR. (1978) ..... University Library  
B.A., Stanislaus State College, 1966; M.A., Loyola University of Los Angeles, 1968; M.L.S., Syracuse University, 1971. Associate Librarian.
- ADAMS, JOHN P., JR. (1970) ..... Economics  
M.A., Claremont Graduate School, 1968; Ph.D., 1972. Professor.
- ADAMS, STEPHEN H. (1974) ..... Associated Students, Inc.  
B.S., Southern Illinois University, Edwardsville, 1969; M.S., Kansas State University, 1973.  
Interim Director.
- AHERN, JAMES J. (1980) ..... Agricultural Management  
B.S., California State Polytechnic College, Pomona, 1971; M.S., University of Maryland, 1973; Ph.D., 1980. Assistant Professor.
- AIKEN, JAMES L. (1976) ..... Counseling Services  
B.A., University of Florida, 1964; M.Ed., 1965; Ph.D., Missouri University, 1970. Associate Director.
- ALEXANDER, WILLIAM M. (1958) ..... Political Science  
B.S., Oregon State University, 1949; M.S., 1951; M.A., Pennsylvania State University, 1953; Ph.D., University of Oregon, 1962; additional graduate study, University of Stockholm, George Washington University, University of Georgia. Professor.
- AL-HADAD, SABAH (1965) ..... Mathematics  
B.S., Texas Technological College, 1960; M.A., California State Polytechnic College, 1962; Ed.D., Arizona State University, 1972. Associate Professor.
- ALLEN, RAY R. (1955) ..... Engineering Technology  
B.A., Santa Barbara State College, 1942; M.A., California State Polytechnic College, 1965; additional graduate study, University of Southern California. Professor.
- AMANZIO, JOSEPH C. (1971) ..... Architecture  
B.Arch., University of Florida, 1967; M.Arch., Washington University, 1974. Professor.  
Registered Architect, California.
- AMARAL, ALFRED W. (1967) ..... University Foundation  
B.S., California State Polytechnic College, 1964; M.B.A., Golden Gate College, 1970. Executive Director.
- AMEDEE, GASTON (1976) ..... Soil Science  
B.S., University of Haiti, 1963; M.S., University of Connecticut, 1971; Ph.D., Cornell University, 1974. Associate Professor.
- ANDERSON, C. ROBERT (1982) ..... Public Affairs  
B.A., Duke University, 1965; M.A., University of Missouri, 1973. University Editor.

- ANDERSON, MARSHALL L. (1975) ..... Civil and Environmental Engineering  
B.S., University of Minnesota, 1943; M.S., 1949; Ph.D. University of Wisconsin, 1972. Professor. Registered Professional Engineer, South Dakota.
- ANDERSON, RUSSELL K. (1955) ..... Animal and Veterinary Science  
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956. Professor.
- ANDERSON, YVONNE M. (1980) ..... Student Health Services  
A.B., University of Kansas, 1951; Medical Technology Internship, 1982. Clinical Laboratory Technologist. California Licensed Clinical Laboratory Technologist, American Association of Bioanalysts Supervisor Certified.
- ANDOLI, FREDERICK P. (1968) ..... Biological Sciences  
B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Professor.
- ANDRE, BARBARA R. (1973) ..... Student Affairs  
B.A., Humboldt State University, 1969; M.A., California Polytechnic State University, 1971. Assistant Dean.
- ANDREOLI, ALFRED E. (1963) ..... Aeronautical and Mechanical Engineering  
B.S., University of Colorado, 1954; M.S., California Institute of Technology, 1956; additional graduate study, University of Colorado. Professor. Registered Professional Engineer, California.
- ANDRESEN, JAMES G. (1956) ..... Aeronautical and Mechanical Engineering  
B.S., California State Polytechnic College, 1956; M.Eng., 1979. Assistant Professor.
- ANDREWS, CHARLES T. (1972) ..... Accounting  
B.S., Eastern Illinois University, 1960; M.B.A., Bowling Green State University, 1963; D.B.A., Indiana University, 1968. Professor. Certified Public Accountant.
- ANGLEY, STEPHEN F. (1982) ..... Ornamental Horticulture  
B.S., Berea College, 1969; M.S., Clemson University, 1972. Assistant Professor.
- APFELBERG, HERSCHEL L. (1971) ..... Graphic Communications  
B.S., Rochester Institute of Technology, 1965; M.A., California Polytechnic State University, 1973. Professor.
- APODACA, EDUARDO A. (1973) ..... CM/P  
B.A., University of Texas at El Paso, 1963; M.S., University of Southern California, 1979. Director.
- ARMSTRONG, GENE A. (1970) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1972. Professor.
- ASBURY, ROBERT F., JR. (1964) ..... Architecture  
B.S., University of Kansas, 1954; M.Arch., 1961; M.Ed., University of Hawaii, 1973. Professor. Registered Architect, Kansas.
- ATLEE, CHARLES B., JR. (1969) ..... Crop Science  
B.S., Pennsylvania State University, 1950; M.S., University of California, Davis, 1962. Professor.
- ATRÉ, SHARAD D. (1974) ..... Architecture  
B.Arch., Summa Cum Laude, University of Baroda, India, 1963; B.Arch., Washington University, 1965; M.Arch., University of Colorado, 1973. Associate Professor. Registered Architect, California and India.
- ATTALA, EMILE E. (1970) ..... Information Systems  
B.S., Cairo University, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D., University of California, Santa Barbara, 1974. Interim Associate Provost.
- ATWOOD, LINDA (1974) ..... Chemistry  
B.A., Bard College, 1968; M.A., Wesleyan University, 1973; Ph.D., 1974. Professor.
- AUSSIEKER, MELVIN W., JR. (1980) ..... Management  
B.S., University of California, Berkeley, 1968; M.B.A., 1969; Ph.D., 1974. Professor.
- AVEY, RENNY J. (1973) ..... Agricultural Management  
B.S., California State Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.



- BABOS, PARASCHOS** (1972) ..... Biological Sciences  
B.S., Birmingham University, England, 1960; Ph.D., London University, England, 1962.  
Associate Professor.
- BACHMAN, ALFRED M.** (1970) ..... Mathematics  
B.S., Western Oregon State College, 1952; M.Ed., 1960, M.S., 1964; Ph.D., University of  
Oregon, 1968. Associate Professor.
- BACKER, WILLIAM R.** (1977) ..... Engineering Technology  
B.M.E., Rensselaer Polytechnic Institute, 1949; M.S., Massachusetts Institute of Technology,  
1950. Professor and Department Head. Registered Professional Engineer, California,  
Massachusetts.
- BAGNALL, JAMES R.** (1969) ..... Architecture  
B.A., Occidental College, 1957; M.Arch., University of California, Berkeley, 1974. Professor.
- BAILEY, CHRISTINA ANNE** (1978) ..... Chemistry  
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Associate  
Professor.
- BAILEY, PHILIP S.** (1969) ..... School of Science and Mathematics  
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor and Interim Dean.
- BAILLIE, ALLAN S.** (1978) ..... Management  
B.S., Ohio University, 1954; M.B.A., University of Washington, 1960; Ph.D., 1978. Professor.
- BAKER, EDWARD H.** (1968) ..... Aeronautical and Mechanical Engineering  
B.S., Northwestern University, 1958; M.S., University of California, 1963; Ph.D., North-  
western University, 1965. Professor.
- BAKER, WARREN J.** (1979) ..... President  
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966.  
President.
- BALDWIN, MARYLUD** (1982) ..... Education  
A.B., Wilson College, 1967; M.Ed., Virginia Commonwealth University, 1973; Ph.D., Uni-  
versity of California, Berkeley and San Francisco State University, 1983. Assistant Professor.
- BALL, R. WAYNE** (1969) ..... Student Health Services  
A.B., Westminster College, Missouri, 1957; M.D., University of Missouri School of Medi-  
cine, 1961; Internship, Mercy Hospital, Des Moines; Residency, General Practice, Santa  
Barbara General Hospital; Board Certified Family Practice, 1974. Associate Director.
- BALL, STEPHEN W.** (1983) ..... Philosophy  
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978. Assistant  
Professor.
- BALLEW, THOMAS J.** (1975) ..... Architectural Engineering  
B.S., University of Oklahoma, 1954; M.A., Arizona State University, 1972. Associate Profes-  
sor. Registered Civil Engineer, California; Registered Architect, California.
- BALTHASER, LAWRENCE H.** (1969) ..... Physics  
B.A., Rutgers University, 1960; M.A., Indiana University, 1963; Ph.D., 1969. Professor.
- BAMOSSY, GARY J.** (1982) ..... Business Administration  
B.A., California State College, Northridge, 1971; M.S., 1975; Ph.D., University of Utah, 1983.  
Associate Professor.
- BANKS, BERNARD W.** (1969) ..... Mathematics  
B.A., San Diego State College, 1964; M.S., 1967; Ph.D., Oregon State University, 1975.  
Associate Professor.
- BARBICA, ELSIE K.** (1977) ..... Counseling Services  
B.A., California State Polytechnic College, 1966; M.S. 1967. Counselor.
- BARCLAY, KENNETH B.** (1979) ..... Activities Planning Center  
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D.,  
Kent State University, 1975. Director.
- BARNES, TIMOTHY M.** (1969) ..... History  
B.A., University of New Mexico, 1965; M.A., 1966; Ph.D., 1970. Professor.

- BARTHELS, KATHARINE M. (1978) ..... Physical Education and Recreation  
Administration  
B.S., University of California, Los Angeles, 1961; M.S., University of California, Santa  
Barbara, 1964; Ph.D., Washington State University, 1973. Associate Professor.
- BASOR, ESTELLE L. (1976) ..... Mathematics  
B.A., University of California, Santa Cruz, 1969; Ph.D., 1975. Associate Professor.
- BATTERSON, RONALD E. (1971) ..... Architecture  
B.S., University of Cincinnati, 1964; M.Arch., University of Washington, 1970; graduate  
study, Danish Royal Academy of Arts. Professor. George C. Marshall fellowship grant.  
Registered Architect, Ohio.
- BAUMGARTEN, GEORGE M. (1969) ..... Architecture  
B.Arch., University of Michigan, 1947; M.Arch., University of California, Berkeley, 1976.  
Professor. Registered Architect, New York, Ohio, Florida, Missouri, Indiana, North  
Carolina.
- BAUR, LAWRENCE E., JR. (1965) ..... Accounting  
B.B.A., University of Michigan, 1954; M.B.A., 1957. Associate Professor. Certified Public  
Accountant.
- BAYNE, JAY S. (1973) ..... Computer Science and Statistics  
B.S., University of California, Santa Barbara, 1969; M.S., 1971; Ph.D., 1977. Professor.
- BEARDSLEY, GEORGE L., JR. (1975) ..... Economics  
B.A., University of California, Berkeley, 1971; M.A., University of Pennsylvania, 1973;  
Ph.D., 1974. Associate Professor.
- BEECHER, LLOYD N. (1969) ..... History  
B.A., California State College, Fullerton, 1965; M.A., 1966; Ph.D., University of Georgia,  
1970. Professor.
- BENNETT, DARRELL F. (1971) ..... Student Health Services  
B.S., University of Arizona, 1965. Pharmacist.
- BERG, LORRAINE M. (1983) ..... Student Health Services  
R.N., Cuesta College, 1975; N.P., Family Planning, San Jose State University, 1982. Nurse  
Practitioner.
- BERMANN, JAMES (1964) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1959, 1961; M.S., Michigan State University, 1971;  
Ed.D., Brigham Young University, 1979. Professor.
- BERNSTEIN, STAN (1980) ..... Public Affairs  
B.S., New York University, 1961; A.M., University of Missouri, 1962. Director.
- BERTOZZI, DAN, JR. (1974) ..... Business Administration  
A.B., University of California, Berkeley, 1966; M.B.A., 1969; J.D., 1971. Professor.
- BETHEL, A. C. W. (1968) ..... Philosophy  
B.A., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974. Associate  
Professor.
- BEUG, JAMES L. (1973) ..... Computer Science and Statistics  
B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D., 1974.  
Professor.
- BEYER, EDGAR H. (1981) ..... Crop Science  
B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Assistant  
Professor.
- BEYMER, CHARLES R. (1966) ..... University Library  
B.S., University of Wisconsin, 1950; M.L.S., 1955; additional graduate study, University of  
Wisconsin, University of California, Berkeley. Assistant Director.
- BIRKETT, RICHARD J. (1955) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1953; M.S., Kansas State University, 1963. Profes-  
sor and Interim Department Head.
- BLANK, KAREN L. (1978) ..... University Library  
B.A., California State University, Northridge, 1974; M.S.L.S., University of Southern Cali-  
fornia, 1975; M.B.A., Golden Gate University, 1980. Senior Assistant Librarian.

- BLANK, STEVEN C. (1979) ..... Agricultural Management  
B.A., California State College, Stanislaus, 1976; M.B.A., University of Massachusetts, 1977;  
M.S., University of Hawaii, 1979; Ph.D., 1980. Assistant Professor.
- BLODGET, ROBERT L. (1974) ..... Child Development and Home Economics  
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Associate  
Professor.
- BOBELE, H. KENNETH (1981) ..... Management  
B.S., University of California, Los Angeles, 1963; Ph.D., 1970. Associate Professor.
- BOCHE, RAYMOND E. (1969) ..... Computer Science and Statistics  
B.S., California State Polytechnic College, SLO, 1958; M.S., San Jose State College, 1966;  
Ph.D., Texas Tech University, 1971. Professor.
- BONDS, ROBERT V. (1972) ..... Learning Assistance Center  
B.A., San Jose State College, 1965; M.S., University of California, Los Angeles, 1972; M.A.,  
California Polytechnic State University, 1978; additional graduate study, University of Cali-  
fornia, Santa Barbara. Counselor.
- BOONE, JOSEPH C. (1968) ..... Physics  
B.A., Earlham College, 1962; M.A., University of Wisconsin, 1967; Ph.D., 1970. Professor.
- BOOTH, JAMES S. (1972) ..... Biological Sciences  
B.S., Los Angeles State College, 1959; M.S., University of Southern California, 1962; Ph.D.,  
1968. Associate Professor.
- BOSTROM, ROBERT M. (1956) ..... Housing  
B.S., California State Polytechnic College, 1956; M.A., 1970. Director.
- BOTWIN, MICHAEL (1981) ..... Architectural Engineering  
B.S., University of Miami, 1962; M.S., Rensselaer Polytechnic Institute, 1964; Ph.D., 1968.  
Associate Professor.
- BOWKER, LESLIE S. (1974) ..... Biological Sciences  
B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington  
State University, 1974. Professor.
- BRADLEY, DIANNE S. (1981) ..... Placement Center  
B.S., Northwestern University, 1970; M.S., University of Northern Colorado, 1979. Career  
Placement Adviser.
- BRADY, MARY L. (1968) ..... University Library  
B.A., Mundelein College, 1960; M.A.L.S., Rosary College, 1966; M.A., California Polytechnic  
State University, 1978. Librarian.
- BRAUNINGER, ANDREA (1974) ..... Student Health Services  
A.B., California State University, San Jose, 1966; M.D., University of Southern California,  
1971; Medical Internship, University of Florida, 1972. Physician.
- BREAZEALE, CONNIE R. (1966) ..... Child Development and Home Economics  
B.A., California State Polytechnic College, 1960; M.A., 1966. Associate Professor.
- BRECKENRIDGE, PATRICIA HAMER (1975) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, San Luis Obispo, 1970; M.L.A., California State  
Polytechnic University, Pomona, 1979; additional graduate study, California Polytechnic  
State University. Associate Professor.
- BRENNER, PATRICIA A. (1970) ..... English  
B.S., Bob Jones University, 1957; M.A., Middlebury College, 1963; Ph.D., Kent State Univer-  
sity, 1970. Professor.
- BRODIE, DAVID A. (1970) ..... Architecture  
B.Arch., University of Capetown, South Africa, 1953; M.Arch., University of California,  
Berkeley, 1964. Professor.
- BROWN, BARBARA, P. (1981) ..... Student Health Services  
State Registered Nurse, St. Margaret's Hospital, England, 1957; R.N., California, 1963; A.S.,  
Cuesta College, 1979; B.S.N., California State College, Bakersfield, 1980. Registered Nurse.  
Public Health Certificate.

- BROWN, CARL R.V. (1982) ..... English  
B.A., Arizona State University, 1971; M.A., 1972; Ph.D., Stanford University, 1977. Assistant Professor.
- BROWN, GEORGE M., III (1982) ..... Agricultural Engineering  
B.S., University of California, Davis, 1973; Assistant Professor.
- BROWN, JOHANNA B. (1969-1973) (1974) ..... University Library  
B.A., Saint Mary's College, 1966; M.L.S., State University of New York at Geneseo, 1967. Associate Librarian.
- BROWN, KENNETH L. (1980) ..... Engineering Technology  
B.V.E., California Polytechnic State University, 1979; M.A., 1980. Assistant Professor.
- BROWN, ROBERT J. (1969) ..... Biological Sciences  
B.S., California State College, Los Angeles, 1964; M.S., Arizona State University, 1967; Ph.D., University of Toronto, Canada, 1972. Professor.
- BROWN, RONALD F. (1974) ..... Physics  
B.A., University of California, Riverside, 1962; M.A., 1964; Ph.D., 1968. Associate Professor.
- BROWN, RUSSELL H. (1978) ..... Student Affairs  
B.A., Whitworth College, 1958; M.A., University of Nebraska, 1960; Ph.D., 1967. Dean of Students.
- BROWN, WILLIAM H. (1957) ..... Architecture  
B.Arch., University of Florida, 1954; M.Arch., 1968; additional graduate study, University of Sydney. Professor. Registered Architect, California.
- BRUCKART, WILLIAM L. (1969) ..... Industrial Technology  
B.S., University of Kentucky, 1942; M.S., Ohio State University, 1953; additional graduate study, Bowdoin College, Massachusetts Institute of Technology. Professor. Registered Professional Engineer, California, Kentucky.
- BRUG, RICHARD C. (1978) ..... Public Safety  
B.A., California State University, Long Beach, 1974. Director.
- BRUMLEY, RICHARD L. (1981) ..... University Library  
B.S., Utah State University, 1963; M.S., 1965; M.L.S., University of California, Berkeley, 1975. Senior Assistant Librarian.
- BUCCOLA, VICTOR A. (1962) ..... Physical Education and Recreation  
Administration  
B.S., California State Polytechnic College, 1956; M.A., 1957; Ed.D., Arizona State University, 1972. Professor.
- BUCICH, RICHARD A. (1963) ..... Electronic and Electrical Engineering  
B.S., Illinois Institute of Technology, 1954; M.S., 1956. Assistant Professor.
- BUFFA, ANTHONY J. (1970) ..... Physics  
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. Professor.
- BURGUNDER, LEE B. (1983) ..... Business Administration  
B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981. Associate Professor.
- BURNS, CHARLOTTE B. (1974) ..... Ornamental Horticulture  
B.A., University of California, Los Angeles, 1951; M.A., 1978, California Polytechnic State University, San Luis Obispo; graduate study, University of Hawaii; University of California, Berkeley and Irvine. Professor.
- BURRELL, SHEL A. (1973) ..... Placement Center  
B.A., University of California, San Diego, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.
- BURROUGHS, SARAH E. (1967) ..... Child Development and Home Economics  
B.S. and Certificate in Medical Technology, University of Michigan, 1956; Ph.D., University of California, 1967. Professor.

- BURT, CHARLES M. (1978) ..... Agricultural Engineering  
B.S., California Polytechnic State University, 1973; M.S., Utah State University, 1975. Professor. Registered Civil Engineer and Agricultural Engineer, California.
- BURT, WALLACE H. (1968) ..... Accounting  
B.S., University of California, 1949; M.B.A., University of Denver, 1962; M.P.A., University of Southern California, 1975. Associate Professor. Certified Public Accountant.
- BURTON, JOSEPH B. (1981) ..... Architecture  
B.Arch., M.Arch., University of Texas, 1975; Ph.D., University of Pennsylvania, 1983. Assistant Professor.
- BURTON, ROBERT E. (1968) ..... History  
A.B., San Diego State College, 1962; M.A., University of Oregon, 1964; Ph.D., 1969. Professor and Department Head.
- BUSSELEN, HARRY J., JR. (1975) ..... School of Human Development and Education  
B.S., California State College, Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor and Interim Dean.
- BUTLER, J. KENT (1977) ..... Industrial Engineering  
B.S., Arizona State University, 1961; M.S., 1963; Ph.D., 1971. Professor.
- BUXBAUM, JAMES M. (1978) ..... Business Administration  
B.A., Harvard College, 1949; J.D., Columbia University Law School, 1955; M.A., Claremont Graduate School, 1976; Ph.D., 1978; additional study, University of Paris, Hague Academy of International Law. Associate Professor.
- CABRERA, GILBERT (1981) ..... Student Academic Services  
B.S., California Polytechnic State University, 1980; additional graduate study, Monterey College of Law, California Polytechnic State University. Program Information Specialist.
- CAIN, DAVID J. (1980) ..... Counseling Services  
B.A., University of Richmond, 1966; M.S., Virginia Commonwealth University, 1958; Ph.D., University of Wyoming, 1972; Diplomate in Clinical Psychology of American Board of Professional Psychology. Counselor.
- CAIRNS, EDWARD A. (1969) ..... English  
B.A., Stanford University, 1956; M.A., San Francisco State University, 1963; Ph.D., University of Denver, 1971. Associate Professor.
- CANO, RAUL J. (1974) ..... Biological Sciences  
B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of Montana, 1974. Professor.
- CANTU, R. DAVID (1980) ..... Placement Center  
B.S., California State Polytechnic College, 1969; M.S., 1974; M.A., 1975. Career Placement Adviser.
- CAREY, CATHRYN GAIL (1978) ..... Student Health Services  
A.R.R.T., C.R.T. Santa Monica Hospital 1961; postgraduate work, Cedars Sinai and Loma Linda Hospitals. Radiologic Technologist.
- CARNEGIE, E. J. (1963-64) (1965) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1962; M.Eng., University of California, Davis, 1963. Professor and Department Head. Registered Mechanical Engineer, California.
- CARPENTER, THOMAS W. (1968) ..... Aeronautical and Mechanical Engineering  
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Professor.
- CARTER, LARK P. (1981) ..... School of Agriculture and Natural Resources  
B.S., Iowa State University, 1953; M.S., 1956; Ph.D., 1960. Dean.
- CARY, ARTHUR S. (1974) ..... Physics  
B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969. Professor.
- CASEY, GLEN R. (1982) ..... Agricultural Education  
B.S., Chico State College, 1966; M.S., California Polytechnic State University, San Luis Obispo, 1979. Assistant Professor.

- CENSULLO, ALBERT C. (1974) ..... Chemistry  
B.S., Villanova University, 1969; Ph.D., Pennsylvania State University, 1975. Associate Professor.
- CHAMBERLAIN, JANE (1980) ..... Placement Center  
B.S., California Polytechnic State University. Career Placement Adviser.
- CHAPMAN, ARTHUR J. (1972) ..... Architecture  
B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State University, 1971; additional graduate study, University of California, Los Angeles. Professor.
- CHEDA, ARCHIE D. (1980) ..... Engineering Technology  
B.S., California State Polytechnic College, 1969; M.S., University of Minnesota, 1978. Assistant Professor. Registered Professional Engineer, California.
- CHEEK, DONALD K. (1973) ..... Education  
B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D., Temple University, 1971. Professor.
- CHESTNUT, F. STUART (1963) ..... Physical Education and Recreation Administration  
B.S., Indiana University, 1951; M.S., 1963; additional graduate study, Indiana University, University of Oregon. Professor.
- CHEW, MARIE (1976) ..... Student Health Services  
R.N., St. Joseph College, Maryland; 1959; B.S., 1959. ANA Board Certificate, 1983. Nurse Practitioner.
- CHIPPING, DAVID H. (1971) ..... Physics  
B.S., Cambridge University, England, 1965; M.S., Stanford University, 1967; Ph.D., 1970. Professor.
- CHIZEK, GAYLORD J. (1958) ..... Agricultural Management  
B.S., Kansas State College, 1957; M.S., 1958; additional graduate study, Oregon State University. Professor.
- CHOU, THOMAS T. L. (1961) ..... Electronic and Electrical Engineering  
B.S., Chinese National Chekiang University, 1947; M.S., University of Washington, 1956; additional graduate study, University of California, Los Angeles and Berkeley. Professor.
- CHRISTENSON, ROBERT A. (1970) ..... Child Development and Home Economics  
B.S., University of Utah, 1963; M.S., Brigham Young University, 1968; Ph.D., 1970. Professor.
- CIANO, DAVID A. (1973) ..... Financial Aid  
B.A., University of Redlands, 1966; J.D., University of California, Los Angeles, 1972. Counselor.
- CICHOWSKI, ROBERT S. (1971) ..... Chemistry  
B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.
- CIRONE, JOAN M. (1971) ..... Student Health Services  
R.N., Cuesta College, 1971; Nurse Practitioner, University of California, Los Angeles, 1974; B.S.N., California State College, Bakersfield, 1979; M.A., California Polytechnic State University, San Luis Obispo, 1983; M.P.A., University of San Francisco, 1983. Supervising Nurse.
- CIROVIC, MICHAEL M. (1968) ..... Electronic and Electrical Engineering  
B.E., New York University, 1965; M.S., 1968. Professor.
- CLARK, WILLIAM E. (1977) ..... Aeronautical and Mechanical Engineering  
B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Professor. Registered Professional Engineer, California.
- CLAUSE, ODILE M. (1976) ..... Foreign Languages  
B.A., University of Wyoming, 1967; M.A., 1968; Ph.D., University of Colorado, 1975. Associate Professor.
- CLENDENEN, HARRIET (1977) ..... Student Academic Services  
B.A., Central Michigan State University, 1953; M.A., California Polytechnic State University, 1979. Coordinator of Disabled Student Services.

- CLERKIN, EDWARD J. (1964) ..... Electronic and Electrical Engineering  
B.S., Colorado State University, 1950; M.S., University of Idaho, 1962; additional graduate study, Utah State University, Colorado State University, Oklahoma University. Professor. Registered Professional Engineer, California.
- CLOGSTON, FRED L. (1960) ..... Biological Sciences  
B.A., B.S., Western Washington College, 1950; M.S., University of Washington, 1956; Ph.D., 1965. Professor.
- CLOONAN, CLIFFORD B. (1957) ..... Electronic and Electrical Engineering  
B.S., University of Colorado, 1955; M.S., Montana State University, 1961; Ph.D., University of Colorado, 1975. Professor.
- COATS, DONALD M. (1964) ..... Academic Programs  
B.S., California State Polytechnic College, 1964; M.A., 1969. Associate Dean, Educational Services.
- COCHRAN, BURT, JR. (1976) ..... Student Health Services  
M.D., University of Southern California Medical School, 1949. Medical Officer.
- COCHRANE, MONA (1970) ..... Student Health Services  
R.N., Knapp College of Nursing, Santa Barbara, 1953. Nurse Practitioner.
- COE, ROBERT K. (1978) ..... Management  
B.S., 1957; M.B.A., 1958; Ph.D., Syracuse University, 1963; B.A., California State College, Bakersfield, 1977. Professor.
- COLEMAN, EUGENE F. (1972) ..... Graphic Communications  
B.S., University of Pittsburgh, 1934; graduate study, University of Pittsburgh, Washington University. Professor.
- COLEMAN, JAMES W. (1973) ..... Social Sciences  
B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Professor.
- COLEMAN, WILLIE M. (1980) ..... Activities Planning Center  
B.A., San Francisco State College, 1966; M.S.W., University of California, Berkeley, 1971; Ph.D., University of California, Irvine, 1982. Assistant Director.
- COLOMÉ, JAIME S. (1972) ..... Biological Sciences  
B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974. Professor.
- COLVIN, MICHAEL R. (1979) ..... Mathematics  
B.A., University of Houston, 1968; M.A., 1970; Ph.D., 1976. Assistant Professor.
- CONNELY, JOHN B. (1970) ..... Education  
B.A., University of Southern California, 1958; Ph.D., 1970. Professor and Coordinator of Liberal Studies and International Programs.
- CONNER, E. WESLEY (1963) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1956; M.Phil., University of Nottingham, England, 1974. Professor. Licensed Landscape Architect, California.
- CONWAY, JAMES R. (1969) ..... Speech Communication  
B.A., California State College, Los Angeles, 1966; M.A., 1968; Ph.D., University of Southern California, 1977. Associate Professor.
- COOK, BARBARA E. (1972) ..... Social Sciences  
A.B., Duke University, 1965; M.A., Stanford University, 1967; Ph.D., 1974. Associate Professor.
- COOMBS, LEE CHARLES (1969) ..... Chemistry  
B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Professor.
- COOPER, ALAN F. (1970) ..... Biological Sciences  
B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Associate Professor. Registered Architect, California.
- COOPER, ALLAN R. (1975) ..... Architecture  
B.A., Rice University, 1967; B.Arch., 1968; M.Arch., Cornell University, 1971. Associate Professor.

- COOPER, BLAIR R. (1983) ..... Animal and Veterinary Science  
B.S., California Polytechnic State University, 1977; M.S., University of Nevada, Reno, 1979.  
Assistant Professor.
- COOPER, MARK A. (1978) ..... Engineering Technology  
B.S., California State Polytechnic College, 1968; M.S., Arizona State University, 1978; additional graduate study. Associate Professor.
- COOPER, MARY P. (POLLY) (1981) ..... Architecture  
B.A., Wellesley College, 1963; M.Ed., Harvard University, 1964; M.Arch., University of California, Berkeley, 1971; M.L.A., 1974. Associate Professor. Registered Architect, California.
- COTA, HAROLD M. (1966) ..... Civil and Environmental Engineering  
B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.
- COTKIN, GEORGE B. (1980) ..... History  
B.A., Brooklyn College (C.U.N.Y.), 1972; M.A., Ohio State University, 1974; Ph.D., 1978. Associate Professor.
- COX, WILLIAM J. (1982) ..... Crop Science  
B.A., College of the Holy Cross, 1970; M.S., California State University, Fresno, 1978; Ph.D., Oregon State University, 1982. Assistant Professor.
- CRABB, A. CHARLES (1978) ..... Crop Science  
B.S., University of California, Davis, 1973; M.S., Bowling Green State University, 1974. Associate Professor.
- CRABTREE, H. SANDRA (1979) ..... Child Development and Home Economics  
B.S., California State Polytechnic College, 1961; M.S., University of Wisconsin, 1973; Ph.D., Colorado State University, 1979. Associate Professor.
- CRANE, FRANKLIN S. (1958) ..... Aeronautical and Mechanical Engineering  
and Engineering Technology  
B.S., Colorado School of Mines, 1943; graduate study, Massachusetts Institute of Technology. Associate Professor. Registered Professional Engineer, California.
- CRIVELLO, JOHN H. (1971) ..... Intercollegiate Athletics  
B.S., California State University, San Jose, 1969; M.S., California Polytechnic State University, 1970. Coach.
- CRUIKSHANKS, RANDAL L. (1972) ..... Political Science  
B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Professor and Department Head.
- CULVER, JOHN H. (1975) ..... Political Science  
B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Professor.
- CURRIER, SUSAN (1980) ..... English  
B.A., Mount Holyoke College, 1969; M.A., University of Massachusetts, 1970; Ph.D., 1979. Assistant Professor.
- CURTIS, WILLIAM D. (1961) ..... Psychology  
B.A., University of Redlands, 1948; M.A., University of California, Los Angeles, 1951; Ph.D., University of Denver, 1960. Professor.
- CURZON, GORDON (1970) ..... English  
B.S., DePaul University, 1941; B.A., St. Mary's College, 1945; M.A., Western Washington State University, 1966; Ph.D., University of California, Riverside, 1969. Associate Professor.
- DAKAN, REBECCA B. (1980) ..... University Library  
A.B., University of California, Davis, 1971; M.L.S., University of Kentucky, 1973. Assistant Librarian.
- D'ALBRO, JAMES A. (1969) ..... Ornamental Horticulture  
B.S., Cornell University, 1966; M.S., University of California, Davis, 1969; Ph.D., Michigan State University, 1980. Professor.



- DALY, JAMES C. (1972) ..... Computer Science and Statistics  
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Professor.
- DANA, CHARLES H. (1982) ..... Computer Science and Statistics  
B.A., University of California, Santa Barbara, 1972; M.S., 1974; Ph.D., 1981. Associate Professor.
- DARNIELLE, MAX E. (1967) ..... English  
B.S., University of Oregon, 1950; M.S., Indiana University, 1967; additional graduate study, Indiana University. Assistant Professor.
- DATTA, SAMIR KUMAR (1968) ..... Electronic and Electrical Engineering  
B.E.E., Jadavpur University, Calcutta, India, 1958; M.S., University of Manchester, England, 1963; Ph.D., 1966. Professor.
- DAUFFENBACH, MARILYN (1978) ..... Student Health Services  
R.N., De Anza College, 1973. Registered Nurse.
- DAVIDMAN, LEONARD (1977) ..... Education  
B.A., Brooklyn College, 1966; M.A., 1972; Ph.D., Stanford University, 1976. Associate Professor.
- DAVIDSON, OTTO C. (1968) ..... Aeronautical and Mechanical Engineering  
B.S., Bucknell University, 1955; M.S., Massachusetts Institute of Technology, 1956; Ph.D., Stanford University, 1960. Associate Professor. Registered Professional Engineer, California.
- DAVIES, THOMAS H. (1983) ..... Music  
B.M.E., Bowling Green State University, 1975; M.A., 1977; D.M.A., University of Southern California, 1983. Assistant Professor.
- DAVIS, KIM (1979) ..... Engineering Technology  
B.E., Southern Technical Institute, 1978; M.S., Rochester Institute of Technology, 1978; Assistant Professor.
- DAVIS, M. LeROY (1976) ..... Agricultural Management  
B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University, 1973. Professor and Department Head.
- DAVIS, MARJORIE A. (1976) ..... Student Health Services  
B.S., University of Oklahoma, 1956; M.T., A.S.C.P., P.H. Microbiologist. Supervising Clinical Laboratory Technologist.
- DeJONG, ALVIN A. (1974) ..... Biological Sciences  
B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Professor.
- DeJONG, AUGUST (1976) ..... Counseling Services  
B.A., Hope College, 1952; M.A., Chapman College, 1967; Ed.D., University of Southern California, 1975. Coordinator of Special Projects.
- DeKLEINE, GLORIA J. (1983) ..... Student Health Services  
B.A., Western Michigan University, 1964; Medical Technologist, Borgess Hospital, 1965. Clinical Laboratory Technologist.
- DeKLEINE, H. ARTHUR (1974) ..... Mathematics  
B.S., Western Michigan University, 1964; M.A., 1965; Ph.D., University of California, Riverside, 1968. Professor.
- DELANY, JAMES E. (1970) ..... Mathematics  
A.B., San Diego State College, 1961; Ph.D., Iowa State University, 1966. Professor.
- DeLATOUR, CHRISTOPHER (1978) ..... Physics  
B.S., Georgetown University, 1969; M.S., Massachusetts Institute of Technology, 1971; Ph.D., 1974. Associate Professor.
- DeLEY, WARREN W. (1971) ..... Social Sciences  
A.B., Stanford University, 1956; M.A., 1957; M.A., University of California, Los Angeles, 1963; C. Phil., 1968; Ph.D., 1970. Professor.
- DELVAGLIO, PETER A. (1970) ..... Graphic Communications  
B.S., Rochester Institute of Technology, 1963; M.A., California Polytechnic State University, 1973. Assistant Professor.

- DENEL, MUSTAFA BILGI (1981) ..... Architecture  
B.S., Robert College, Istanbul, 1959; M.F.A., Princeton University, 1963; Ph.D., Technical University of Istanbul, 1981. Associate Professor. Registered Civil Engineer and Architect, Turkey.
- DENSHAM, ROBERT S. (1980) ..... Art  
B.A., California State University, Long Beach, 1967; M.F.A., 1980. Associate Professor.
- DETTLOFF, ERLAND G. (1967) ..... Education  
B.S., Minot State College, 1956; M.A., University of Wyoming, 1962; Ed.D., 1963. Professor.
- DEVORE, JAY L. (1977) ..... Computer Science and Statistics  
B.S., University of California, Berkeley, 1966; M.S., Stanford University, 1968; Ph.D., 1971; additional graduate study, Sheffield University, England. Professor.
- DIAZ, JOE V. (1976) ..... Counseling Services  
B.A., University of Arizona, 1970; M.Ed., 1971; Ph.D., 1976. Counselor.
- DICKERSON, ARTHUR F. (1980) ..... Electronic and Electrical Engineering  
B.S., University of Texas, 1946; M.S., University of Southern California, 1980. Assistant Professor. Registered Professional Engineer, California.
- DICKERSON, ROBERT H. (1970) ..... Physics  
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor.
- DICKEY, RICHARD K. (1956) ..... Electronic and Electrical Engineering  
B.S., University of California, 1948; M.S., 1956; Ph.D., University of California, Santa Barbara, 1969. Professor. Registered Professional Engineer, California.
- DILLS, CHARLES E. (1963) ..... Chemistry  
B.S., North Dakota State University, 1949; M.S., George Washington University, 1951; Ph.D., Harvard University, 1956.
- DILLS, KEITH W. (1983) ..... Art  
B.A., State University of Iowa, 1961; M.A., San Francisco State College, 1969; Ph.D., University of California, Berkeley, 1981. Associate Professor.
- DIMMITT, LAURA SAENZ (1975) ..... Financial Aid  
B.A., University of California, Santa Barbara, 1971; M.A., California Polytechnic State University, 1980. Counselor.
- DINGUS, DELMAR D. (1973) ..... Soil Science  
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.
- DIRKES, LOIS M. (1973) ..... Counseling Services  
B.S., University of California, Los Angeles, 1958; M.S., University of Maryland, 1963; Ph.D., 1973. Counselor.
- DOMPKE, JOANNE (1982) ..... Student Health Services  
R.N., Cuesta College, 1976. Registered Nurse.
- DONALDSON, DOUGLAS D. (1968) ..... Biological Sciences  
A.B., University of California, Berkeley, 1962; M.A., California State College, Los Angeles, 1964; Ph.D., Oklahoma State University, 1969. Professor.
- DONNELL, ROSEMARY TENER (1977) ..... Student Health Services  
R.N., St. Anthony's School of Nursing, Oklahoma, 1967; A.S., Long Beach City College, 1973; Adult Nurse Practitioner Program, California State University, Los Angeles, 1976; Adult N.P. Certification. Nurse Practitioner.
- DOURSON, ROBERT H. (1967) ..... Computer Science and Statistics  
B.S., California Institute of Technology, 1935; M.S., 1941; Ch.E., 1942; additional graduate study, Case Institute of Technology, Southern Illinois University, University of California, Berkeley. Professor.
- DRANDELL, MILTON (1972) ..... Management  
B.A., Southern Methodist University, 1944; M.A., University of Texas, 1945; Ph.D., University of California, Los Angeles, 1951. Professor.

- DRUCKER, HOWARD (1980) ..... Education  
B.A., Hunter College of the City of New York, 1957; M.A., 1961; Ph.D., Florida State University, 1972. Assistant Professor.
- DUARTE, ARTHUR C. (1965) ..... Agricultural Management  
B.S., California State Polytechnic College, 1964; M.S., Oregon State University, 1965; Ph.D., Washington State University, 1975. Professor.
- DUERK, DONNA (1980) ..... Architecture  
B.Arch., B.A., Massachusetts Institute of Technology, 1972; M.Arch, 1981. Associate Professor. Registered Architect, Texas.
- DUFFY, D. JAN (1980) ..... Business Administration  
B.A., Stanford University, 1972; J.D., Case Western Reserve University, 1976. Associate Professor.
- DUNDON, STANISLAUS J. (1970) ..... Philosophy  
B.A., Mt. Carmel College, 1962; M.A., St. John's University, 1965; Ph.D., 1972. Professor.
- DUNIGAN, LOWELL H. (1961) ..... Academic Programs  
B.S., Iowa State University, 1947; M.S., 1948; additional graduate study, University of Southern California. Director of Institutional Research.
- DUSEK, BERNARD W. (1965) ..... Art  
A.B., University of California, Santa Barbara, 1951; M.A., University of Southern California, 1960; additional graduate study, La Jolla California Art Center. Professor.
- DWYER, GARY COLBURN (1973) ..... Landscape Architecture  
B.F.A., Syracuse University, 1967; B.S.L.A., New York State University, 1967; M.A., University of Denver, 1970. Professor.
- EASTHAM, GEORGE M. (1966) ..... Economics  
B.A., Chico State College, 1961; M.A., University of California, Santa Barbara, 1965; Ph.D., Claremont Graduate School, 1978. Professor and Department Head.
- EATOUGH, NORMAN L. (1968) ..... Chemistry  
B.S., Brigham Young University, 1957; B.E.S., 1958; M.S., 1959; M.S.Ch.E., University of Washington, 1960; Ph.D., Brigham Young University, 1968. Professor.
- ECKLUND, VICTOR, J. (1982) ..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1973. Coach.
- EDMISTEN, JOHN W. (1968) ..... Architectural Engineering  
B.S., California State Polytechnic College, 1965; M.Engr., University of California, Berkeley, 1967. Associate Professor. Registered Civil Engineer, California; Registered Architect, California.
- EGGEN, NORMAN R. (1977) ..... Food Science  
B.S., California State Polytechnic College, Kellogg, 1970; M.S., Texas A & M University, 1974. Associate Professor.
- EHRENBERG, JAMES R. (1977) ..... Engineering Technology  
B.S., Gonzaga University, 1960; M.S., Seattle University, 1969; Ed.D., Brigham Young University, 1982. Professor. Registered Professional Engineer, California.
- ELTZROTH, THOMAS E. (1967) ..... Ornamental Horticulture  
B.S., Ohio State University, 1965; M.S., 1966. Professor.
- EMMEL, JAMES R. (1967) ..... Speech Communication  
B.A., Eastern Nazarene College, 1945; Speech Therapy Certification, Northwestern University, 1946; M.A., University of Oklahoma, 1950; Ph.D., Pennsylvania State University, 1959. Professor.
- ENDRES, LELAND S. (1969) ..... Chemistry  
A.B., Middlebury College, 1958; M.A., University of Oregon, 1963; Ph.D., University of Arizona, 1966. Professor.
- ENGLE, PATRICIA L. (1980) ..... Child Development and Home Economics  
B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Assistant Professor.

- ENGLUND, DAVID L. (1973) ..... Child Development and Home Economics  
B.A., Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D., University of Wisconsin, 1969. Professor.
- EPSTEIN, GARY M. (1969) ..... Mathematics  
B.A., University of California, Riverside, 1964; Ph.D., 1969. Professor.
- EQUINO, RICHARD M. (1973) ..... Placement Center  
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., 1970. Director.
- ERICSON, JON M. (1970) ..... School of Communicative Arts and Humanities  
B.A., Pacific Lutheran College, 1952; M.A., Stanford University, 1953; Ph.D., 1961. Dean.
- FABRICIUS, EUGENE DAVID (1970) ..... Electronic and Electrical Engineering  
B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark College of Engineering, New Jersey, 1968. Professor.
- FAHS, MICHAEL L. (1983) ..... Speech Communication  
A.B., California State College, Long Beach, 1972; M.A., University of Southern California, 1974; Ph.D., 1976. Associate Professor.
- FARRELL, GERALD P. (1970) ..... Mathematics  
A.B., San Diego State College, 1961; M.S., 1963; Ph.D., University of California, Los Angeles, 1968. Professor.
- FEDERER, M. DALE (1963) ..... Psychology  
B.S., University of Wyoming, 1951; M.Ed., 1961; Ph.D., 1962. Professor.
- FELDMAN, JACOB (1971) ..... Architectural Engineering  
B.S., University of Delaware, 1961; M.S., 1968. Professor. Registered Civil Engineer, California.
- FERREIRA, LESLIE S. (1978) ..... Dairy Science  
B.S., California State Polytechnic College, 1970; M.S., University of Illinois, 1972; Ph.D., Utah State University, 1980. Professor.
- FIELD, GARY G. (1984) ..... Graphic Communications  
Higher Trade Certificate, Melbourne College of Printing and Graphic Arts, Australia, 1966; Diploma in Printing Technology, Trent Polytechnic, England, 1970; M.B.A., University of Pittsburgh, 1975. Associate Professor.
- FIERSTINE, HARRY L. (1966) ..... School of Science and Mathematics  
B.S., Long Beach State College, 1957; M.A., University of California, Los Angeles, 1961; Ph.D., 1965. Professor and Interim Associate Dean.
- FINCHUM, WILLIS ARNOLD (1976) ..... Engineering Technology  
B.S., Utah State University, 1949; M.S., 1959; graduate study at Purdue University. Professor. Registered Professional Engineer, Indiana, Utah.
- FIORITO, BASIL A. (1977) ..... Child Development and Home Economics  
B.A., Marist College, 1968; M.S., New York University, 1970; M.A., 1975; Ph.D., Syracuse University, 1977. Associate Professor.
- FITZPATRICK, LINDA C. (1983) ..... City and Regional Planning  
A.B., Radcliffe/Harvard, 1967; M.U.P., University of Washington, 1974; Ph.D., 1978. Associate Professor.
- FITZPATRICK, MICHAEL JOHN (1975) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Professor.
- FLANAGAN, JAMES ROBERT (1959) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1959; M.S., 1974. Professor.
- FLORES, ANTHONY B. (1979) ..... Business Affairs  
B.A., California State University, Fullerton, 1973; M.B.A., University of Southern California, 1979; additional graduate study, University of California, Irvine, University of Southern California. Financial Manager.
- FLORES, ROBERT A. (1983) ..... Agricultural Education  
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1978. Assistant Professor.

- FLOYD, DONALD R. (1974) ..... Social Sciences  
B.A., University of California, Berkeley, 1967; M.A., 1968; Ph.D., 1976. Professor.
- FORGENG, WILLIAM D. (1980) ..... Metallurgical and Welding Engineering  
B.Met.E., Cornell University, 1958; Ph.D., Purdue University, 1962. Associate Professor.
- FORT, TOMLINSON, JR. (1982) ..... Office of the President  
B.S., University of Georgia, 1952; M.S., University of Tennessee, 1957; Ph.D., 1957; postdoctoral research, University of Sydney, Australia. Provost.
- FOSTER, THEODORE C. (1970) ..... Physics  
B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.
- FOUNTAIN, H. PAUL (1965) ..... Crop Science  
B.S., California State Polytechnic College, 1963; M.S., University of California, Davis, 1974. Professor.
- FOX, FRANK W. (1957) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1951; M.A., 1957. Professor.
- FREEMAN, H. JOANNE (1975) ..... Industrial Engineering  
B.I.E., Georgia Institute of Technology, 1966; M.S., University of Southern California, 1974; Ph.D., Stanford University, 1982. Professor. Registered Professional Engineer, California.
- FRENCH, STEVEN P. (1981) ..... City and Regional Planning  
B.A., University of Virginia, 1971; M.U.R.P., University of Colorado, 1973; Ph.D., University of North Carolina, 1980. Associate Professor.
- FREY, DENNIS F. (1970) ..... Biological Sciences  
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Professor.
- FREY, THOMAS G. (1970) ..... Chemistry  
B.A., University of Oregon, 1965; Ph.D., University of Idaho, 1970. Professor.
- FREY, WINTON H. (1972) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1958; M.S., Fresno State University, 1972. Professor.
- FRIEDMAN, FRED S. (1975) ..... Engineering Technology  
B.S., University of California, Santa Barbara, 1969; M.S., Loyola University, Los Angeles, 1972. Associate Professor. Registered Professional Engineer, California.
- FRIETZSCHE, ARTHUR H. (1965) ..... English  
B.A., University of California, 1944; M.A., 1945; Ph.D., 1949. Professor.
- FUJITANI, SHARON H. (1977) ..... University Library  
B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.
- GAINES, MERRILL C. (1976) ..... Architecture  
B.B.A., University of Wisconsin 1965; M.Arch. 1973. Associate Professor. Registered Architect, Wisconsin.
- GALLAGHER, GAIL (1978) ..... Student Health Services  
B.S., California State Polytechnic College, 1970; R.N., Cuesta College, 1972. Registered Nurse.
- GAMBLE, LYNNE E. (1976) ..... University Library  
B.A., University of Texas at Austin, 1968; M.L.S., 1969; M.A., California Polytechnic State University, San Luis Obispo, 1979. Assistant to Director.
- GAMBS, ROGER D. (1974) ..... Biological Sciences  
B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Professor.
- GANG, DONNA D. (1967) ..... Student Health Services  
R.N., Regina General Hospital, Canada, 1953; N.P., California Polytechnic State University, San Luis Obispo, 1976; B.S., California State College, Bakersfield, 1983; Certificate in Public Health Nursing, California, 1983. Nurse Practitioner.

- GARNER, EDWARD R. (1967) ..... Aeronautical and Mechanical Engineering  
B.S., Bradley University, 1962; M.S., University of Arizona, 1965; Ph.D., Montana State University, 1973. Professor.
- GASKIN, TIMOTHY A. (1970) ..... Ornamental Horticulture  
B.S., University of California, 1954; M.S., University of Delaware, 1956; Ph.D., Purdue University, 1958; M.B.A., Ohio State University, 1968. Professor.
- GAY, LARRY W. (1979) ..... Industrial Technology  
B.A., California Polytechnic State University, 1975; M.A., 1976; Ed.D., Brigham Young University, 1980. Associate Professor. Licensed General Contractor.
- GEDAYLOO, TEYMOOR (1965) ..... Physics  
B.A., Macalester College, 1957; M.S., University of Washington, 1959; Ph.D., University of Kansas, 1973. Professor.
- GENEREUX, DOUGLAS G. (1970) ..... Agricultural Management  
B.S., University of Nebraska, 1964; M.S., 1969; Ph.D., Colorado State University, 1979. Professor.
- GEOGHAGEN, LOCKSLEY (1977) ..... Student Academic Services  
B.A., University of California, Los Angeles, 1970; M.A., California Polytechnic State University, 1976; additional graduate study, University of California, Santa Barbara. Associate Director.
- GEORGE, DAVID L. (1970) ..... Political Science  
A.B., San Diego State College, 1962; M.A., 1968; Ph.D., University of Oregon, 1970; additional graduate study, University of Michigan Survey Research Center. Professor.
- GERARD, E. DOUGLAS (1951) ..... Facilities Planning and Operations  
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951. Executive Dean.
- GILLHAM, JOHN F. (1975) ..... Landscape Architecture  
B.L.A., University of Oregon, 1962; M.L.A., 1966. Professor.
- GIROLO, JACK E. (1970) ..... Mathematics  
B.A., San Jose State, 1964; M.S., Iowa State University, 1966; Ph.D., 1971. Professor.
- GITTES, KATHARINE SLATER (1983) ..... English  
B.A., University of California, San Diego, 1972; M.A., San Diego State University, 1975; M.A., University of California, San Diego, 1981; Ph.D., 1983. Assistant Professor.
- GLASER, MARGARET J. (1973) ..... Education  
B.S., Marquette University, 1953; M.Ed., 1970; Ed.D., University of Arizona, 1973. Professor.
- GLASS, L. JOE (1970) ..... Agricultural Engineering  
B.S., Purdue University, 1962; M.S., Texas A & M University, 1965; Ph.D., 1971. Professor. Registered Civil Engineer, California.
- GLASSCO, D. EDWARD (1968) ..... Mathematics  
B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D., 1971. Professor.
- GLASSMEYER, SONJA M. (1979) ..... Physical Education and Recreation Administration  
B.S., California Polytechnic State University, 1973; M.S., 1974; Ed.D., Brigham Young University, 1981. Associate Professor.
- GLIDDEN, WALLACE F. (1961) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1952; B.S., University of California, Davis, 1955; D.V.M., 1961. Professor.
- GOERS, JOHN W. F. (1980) ..... Chemistry  
B.S., University of Illinois, 1969; Ph.D., University of California, Los Angeles, 1974. Assistant Professor.
- GOLDBERG, SAUL (1970) ..... Electronic and Electrical Engineering  
B.S., Fairleigh Dickinson University, 1963; M.E., University of Florida, 1964; Ph.D., 1968. Professor.
- GOLDENBERG, STUART (1970) ..... Mathematics  
B.S., University of California, Los Angeles, 1965; M.S., University of California, Riverside, 1969; Ph.D., 1970. Professor.

- GONIEWSKI, MARILYN P. (1978) ..... University Library  
B.A., LeMoine College, 1971; M.S.L.S., University of Southern California, 1975; M.A., California Polytechnic State University, San Luis Obispo, 1981. Senior Assistant Librarian.
- GONZALES, LEONARD A. (1972) ..... Academic Programs  
B.A., University of Maryland, 1966; M.A., Chapman College, 1979; additional graduate study, United States International University. Coordinator of Relations with Schools.
- GOODEN, REGINALD H., JR. (1970) ..... Political Science  
B.A., University of California, Los Angeles, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., 1972. Associate Professor.
- GORDON, RAYMOND G. (1967) ..... Aeronautical and Mechanical Engineering  
B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., University of California, Santa Barbara, 1974. Professor and Department Head. Registered Professional Engineer, California.
- GORDON, ROBERT L. (1967) ..... Ornamental Horticulture  
B.S., California Polytechnic State University, 1981. Associate Professor.
- GOWGANI, GEORGE G. (1970) ..... Crop Science  
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1968; M.S., University of Nevada, 1972; Ph.D., 1975. Professor.
- GRADY, DAVID V. (1971) ..... Biological Sciences  
A.B., University of California, Los Angeles, 1964; Ph.D., 1974. Professor.
- GRANNEMAN, GARY A. (1978) ..... Engineering Technology  
B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Professor. Registered Professional Engineer, Iowa.
- GRANT, DONALD P. (1967) ..... Architecture  
B.Arch., University of Oklahoma, 1961; M.Arch., University of Utah, 1964; Ph.D., University of California, Berkeley, 1974. Professor. Registered Architect, California.
- GRAVES, THEODORE G. (1947) ..... Engineering Technology  
B.A., Humboldt State College, 1940; M.S., Oregon State College, 1957. Professor.
- GRAY, CONSTANCE H. (1976) ..... Biological Sciences  
B.S., University of Massachusetts, 1947; M.S., University of Hawaii, 1951; Ph.D., University of California, Berkeley, 1974. Associate Professor.
- GRAYSON, RANDOLPH L. (1972) ..... Biological Sciences  
B.A., State University of Iowa, 1958; M.A., Washington University, 1963; Ph.D., Michigan State University, 1972. Professor.
- GRAZIANO, VICTOR (1982) ..... Student Academic Services  
B.S., Loyola University, 1968; M.S., Washington State University, 1970. Academic Adviser.
- GREENWALD, HARVEY C. (1973) ..... Mathematics  
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University, 1966; Ph.D., 1970. Professor.
- GRIFFIN, ROBERT E. (1976) ..... University Foundation  
B.S., University of Southern California, 1966; J.D., Western State University, 1974. Assistant to Executive Director.
- GRIMES, JOSEPH E. (1973) ..... Computer Science and Statistics  
B.A., St. Ambrose College, 1963; M.S., Illinois State University, 1968; Ph.D., Iowa State University, 1973. Professor.
- GRINDE, DONALD A., Jr. (1977) ..... History  
B.A., Georgia Southern College, 1966; M.A., University of Delaware, 1968; Ph.D., 1974. Associate Professor.
- GRINNELL, ROBIN R. (1967) ..... Agricultural Engineering  
B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; Ph.D., Purdue University, 1976. Professor.
- GROSZ, DAVID W. (1967) ..... Intercollegiate Athletics  
B.S., University of Oregon, 1960; M.S., 1965. Coach.

- GROVES, JOHN E. (1968)..... Computer Science and Statistics  
B.A., Pasadena College, 1963; M.A., University of California, Riverside, 1965; Ph.D., Kansas State University, 1972. Professor.
- HAFEMEISTER, DAVID W. (1969)..... Physics  
B.S., Northwestern University, 1957; M.S., University of Illinois, 1960; Ph.D., 1964. Professor.
- HAGEN, CHARLES T. (1980)..... Philosophy  
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D., 1981. Assistant Professor.
- HAGGARD, KENNETH L. (1967)..... Architecture  
B.S., Texas A & M, 1958; B.Arch., North Carolina State University, 1963; M.Arch., University of Pennsylvania, 1967. Associate Professor. Registered Architect, Florida and California.
- HALE, THOMAS E. (1966)..... Mathematics  
B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University, 1967; Ph.D., 1972. Professor.
- HALL, MICHAEL H. (1974)..... Animal and Veterinary Science  
B.S., California Polytechnic State University, 1973; M.S., Kansas State University, 1975. Associate Professor.
- HALLMAN, BARBARA McCLUNG (1973)..... History  
B.A., California State University, Los Angeles, 1960; M.A., 1962; Ph.D., University of California, Los Angeles, 1974. Professor.
- HALLOCK, BRENT G. (1979)..... Soil Science  
B.S., University of California, Davis, 1970; M.S., 1972; Ph.D., 1976. Associate Professor and Interim Department Head. Certified Professional Soil Scientist.
- HAMPTON, JOHN K., JR. (1976)..... Biological Sciences  
B.S., Millsaps College, 1947; Ph.D., Tulane University Graduate School, 1949. Professor.
- HANNINGS, DAVID W. (1974)..... Ornamental Horticulture  
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Associate Professor.
- HANSEN, CAROLYN C. (1980)..... Education  
B.S., Valparaiso University, 1967; M.S., University of Wisconsin, 1972; Ed.D., University of Southern California, 1980. Assistant Professor.
- HANSEN, PHYLLIS JEAN (1963)..... University Library  
A.B., University of Illinois, 1960; M.S., 1961. Senior Assistant Librarian.
- HANSON, MICHAEL T. (1978)..... Natural Resources Management  
B.S., Idaho State University, 1970; M.A., University of Missouri, 1973; Ph.D., Texas A & M University, 1976. Associate Professor.
- HARDEN, F. SHELDON (1948)..... Physical Education and Recreation Administration  
B.A., Santa Clara, 1943; M.A., College of the Pacific, 1950. Professor.
- HARGRAVE, TERRY C. (1979)..... Architecture  
B.Arch.Eng., Washington State University, 1965; M.Arch., Massachusetts Institute of Technology, 1978. Associate Professor. Registered Architect, Washington.
- HARIRI, MAHMUD S. (1971)..... Social Sciences  
B.S., Hobart College, 1948; M.A., Columbia University Teachers College, 1953; Ph.D., New School for Social Research, 1968. Professor.
- HARMON-ELLIOTT, ADELAIDE T. (1974)..... Mathematics  
B.S., Fordham University, 1955; M.S., 1964; Ph.D., New York University, 1969. Professor.
- HARPER, LOUIS W. (1977)..... Crop Science  
B.S., Montana State University, 1958; M.S., 1964. Associate Professor.
- HARRIGAN, JOHN E., JR. (1969)..... Architecture  
B.A., University of California, Berkeley, 1959; M.A., San Jose State College, 1962; Ph.D., Colorado State University, 1966. Professor.



- HARRINGTON, JOHN F. (1976) ..... English  
B.A., Washington State University, 1964; M.A., 1966; Ph.D., University of Illinois, 1970.  
Professor and Coordinator of Writing Skills Program.
- HARRIS, JAMES G. (1982) ..... Electronic and Electrical Engineering  
B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse University, 1968.  
Professor and Department Head.
- HARRIS, JOHN H. (1978) ..... Natural Resources Management  
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University, 1972. Associate  
Professor.
- HARRIS, ROY M. (1954) ..... Animal and Veterinary Science  
B.S., Utah State Agricultural College, 1952; M.S., 1954; Ph.D., 1970. Professor.
- HARRIS, WALTER L. (1973) ..... Student Academic Services  
B.S., California Polytechnic State University, 1973; M.A., 1975. Academic Adviser.
- HARTER, LANCE L. (1979) ..... Intercollegiate Athletics  
B.S., Texas Tech University, 1972; M.S., Colorado State University, 1974. Coach.
- HARTIG, DONALD G. (1979) ..... Mathematics  
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Wisconsin-Milwaukee, 1966;  
Ph.D., University of California, Santa Barbara, 1970. Associate Professor.
- HASKELL, CHARLES THOMSON (1963) ..... Mathematics  
B.A., University of Washington, 1946; M.S., University of Arizona, 1961; Ph.D., 1965.  
Professor.
- HASSLEIN, GEORGE J. (1949) ..... Architecture  
B.Arch., University of Southern California, 1945. Professor. FAIA.
- HATCHER, DAVID S. (1980) ..... Architectural Engineering  
B.S., University of Wyoming, 1953; Ph.D., University of Illinois, 1961. Professor and Depart-  
ment Head. Registered Civil Engineer, California.
- HAVANDJIAN, NISHAN (1980) ..... Journalism  
B.A., Haigazian College, Lebanon, 1970; M.A., University of Georgia, 1972; Ph.D., Univer-  
sity of Texas at Austin, 1979. Assistant Professor.
- HAWES, MICHAEL (1967) ..... Engineering Technology  
B.Eng., University College, Dublin, Ireland, 1958; M.S., Ohio State University, 1967. Pro-  
fessor. Registered Professional Engineer, Ohio.
- HAWTHORNE, DANIEL L. (1973) ..... Psychology  
B.A., University of Minnesota, 1968; M.A., University of California, Berkeley, 1970; Ph.D.,  
1973. Associate Professor.
- HAYES, JAMES H. (1969) ..... Journalism  
B.A., San Jose State College, 1950; M.A., University of Florida, 1966; additional graduate  
study, University of Minnesota. Professor.
- HAZEBROOK, HARRY (1968) ..... Electronic and Electrical Engineering  
B.S., Michigan College of Mining and Technology, 1949; M.S., University of Wisconsin,  
1951. Professor.
- HEAD, DWAYNE G. (1966) ..... Physical Education and Recreation Administration  
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963; Ed.D., University  
of Oregon, 1967. Professor.
- HEATON, RICHARD (1970) ..... Intercollegiate Athletics  
B.A., Iowa State Teachers College, 1960; M.A., California State Polytechnic College, n Luis  
Obispo, 1969. Director.
- HEINZ, JOHN A. (1953) ..... Audiovisual  
B.A., University of Washington, 1950; M.A., Ohio State University, 1964. Director.
- HELLYER, GEORGE J. (1980) ..... Agricultural Management  
B.S., University of California, Davis, 1960; M.S., 1973. Assistant Professor.
- HENDERSON, THOMAS R. (1982) ..... Intercollegiate Athletics  
B.A., Occidental College, 1975. Coach.

- HENRY, DAVID (1976) ..... Speech Communication  
A.B., University of California, Berkeley, 1970; M.A., University of California, Davis, 1974;  
Ph.D., Indiana University, 1976. Associate Professor.
- HENRY, PAULA D. (1983) ..... Student Health Services  
R.N., Quincy State Hospital, Massachusetts, 1972; B.S.N., Northeastern University College  
of Nursing, 1976; A.N.P., Peter Brent Brigham/Harvard Medical School Adult Nurse Prac-  
tioner Program, 1977. Nurse Practitioner.
- HENSEL, DONALD W. (1960) ..... History  
B.S., University of North Dakota, 1949; M.A., University of Colorado, 1953; Ph.D., 1957.  
Professor.
- HERLIHY, JOHN J. (1975) ..... Agricultural Management  
B.S., Manhattan College, N.Y., 1962; graduate study, University of Southern California;  
M.B.A., California Polytechnic State University, 1978. Assistant Professor.
- HEWITT, CLARISSA (1976) ..... Art  
B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy, 1976.  
Associate Professor.
- HILL, PATRICK D. (1975) ..... Architecture  
B.Arch., University of Illinois, 1970; M.S., 1972. Associate Professor. Registered Architect,  
Illinois and California.
- HILL, ROBERT W. (1976) ..... Accounting  
B.S., University of California, Berkeley, 1956; M.B.A., 1968; D.B.A., University of Southern  
California, 1975. Professor. Certified Public Accountant.
- HINKLE, MARY ANN (1978) ..... Financial Aid  
B.S., California State Polytechnic College, 1969. Counselor.
- HITCHCOCK, VAUGHAN D. (1962) ..... Physical Education and Recreation Administration  
B.S., Washington State University, 1956; M.A., San Francisco State College, 1965. Professor.
- HIXSON, DOROTHY F. (1974) ..... Student Health Services  
R.N., Salem Hospital School of Nursing, 1945; graduate study, University of California,  
Santa Barbara Extension, Cuesta College. Registered Nurse.
- HOCKADAY, STEPHEN L.M. (1982) ..... Civil and Environmental Engineering  
B.S., London University, 1965; M.S., University of California, Berkeley, 1968; Ph.D., 1969.  
Associate Professor. Registered Professional Engineer, California.
- HOFFMAN, KENNETH A. (1974) ..... Physics  
B.A., University of California, Berkeley, 1966; M.A., 1969; Ph.D., 1973. Professor.
- HOFFMANN, JON A. (1968) ..... Aeronautical and Mechanical Engineering  
B.S., University of Wisconsin, 1964; M.S., 1966; additional graduate study, Wisconsin State  
University. Professor. Registered Professional Engineer, California.
- HOLLAND, V. L. (1972) ..... Biological Sciences  
B.A., Fresno State College, 1966; M.A., 1969; Ph.D., University of California, Berkeley, 1973.  
Professor and Department Head.
- HOLLSTIEN, ROY B. (1973-1976) (1980) ..... Computer Science and Statistics  
B.S., California State Polytechnic College, San Luis Obispo, 1958; M.S., University of Michi-  
gan, 1967; Ph.D., 1971. Professor.
- HOLZ, ALAN W. (1974) ..... Mathematics  
B.A., University of Washington, 1963; M.A., Bowdoin College, 1968; Ph.D., Purdue Uni-  
versity 1972. Professor.
- HOMAN, DENNIS N. (1966) ..... Biological Sciences  
B.A., University of Iowa, 1955; M.S., 1958; Ph.D., 1960. Professor.
- HONEGGER, HARRY H. (1961) ..... Metallurgical and Welding Engineering  
B.S., Oregon State College, 1950; M.S., 1952. Professor.
- HOOD, J. MYRON (1977) ..... Mathematics  
B.A., Grinnell College, 1963; M.S., Northwestern University, 1965; Ph.D., Washington Uni-  
versity, 1970. Associate Professor.

- HOOKS, ROBERT D. (1966) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1961; M.S., Iowa State University, 1964; Ph.D., 1966. Professor.
- HOOVER, ROBERT L. (1970) ..... Social Sciences  
A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate study, University of California, Berkeley, Stanford University. Professor.
- HORGAN, ELLEN S. (1982) ..... Social Sciences  
B.A., Wellesley, 1950; M.A., Earlham College, 1952; Ph.D., University of Missouri, 1969. Associate Professor.
- HORTON, WILLIAM F. (1968) ..... School of Engineering and Technology  
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of California, Los Angeles, 1966. Interim Dean.
- HOULGATE, LAURENCE D. (1979) ..... Philosophy  
B.A., California State University, Los Angeles 1960; M.A., Ph.D., University of California, Los Angeles, 1967. Professor.
- HOULIS, JEROME F. (1959) ..... Chemistry  
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College. Assistant Professor.
- HOWARD, LORRAINE H. (1964) ..... Student Affairs  
B.S., Oregon State College, 1945; Ed.M., Oregon State University, 1961; Ph.D., 1964. Associate Dean.
- HOWARD, WILLIAM A. (1980) ..... City and Regional Planning  
B.A., University of Denver, 1958; M.A., 1960; graduate study, Johns Hopkins University, 1961-63; Ph.D. University of Edinburgh, 1973. Professor and Department Head.
- HOWELL, ROBERT (1974) ..... Art  
B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Associate Professor.
- HSIEH, CARL C. F. (1970) ..... Civil and Environmental Engineering  
B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology, 1965; Ph.D., Northwestern University, 1968. Professor. Registered Professional Engineer, California.
- HSU, JOHN Y. S. (1970) ..... Computer Science and Statistics  
B.S., National Taiwan University, 1959; M.S., University of California, Berkeley, 1964; Ph.D., 1969. Professor.
- HUEHN, KEMPTON L. (1968) ..... Mathematics  
B.S., Iowa State University, 1957; M.S., 1962; Ph.D., Colorado School of Mines, 1974. Professor.
- HUFF, EARL D. (1970) ..... Political Science  
B.A., San Francisco State College, 1959; M.A., University of Idaho, 1969; Ph.D., 1971. Professor.
- HUNT, ROGER M. (1979) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, 1971; M.S., 1978. Assistant Professor.
- HUOT, ROBERT J. (1963) ..... English  
B.A., University of Washington, 1946; M.A., 1951; Ph.D., University of Utah, 1971; additional graduate study. Professor.
- HUTCHINSON, JAMES R. (1971) ..... Graphic Communications  
B.F.A., Carnegie Institute of Technology, 1955; B.S., 1959; M.A., California State University, Dominguez Hills, 1977. Professor.
- HUTTON, REX L. (1966) ..... Mathematics  
B.S., Baldwin Wallace College, 1959; M.S., Illinois Institute of Technology, 1964; Ed.D., Arizona State University, 1972. Professor.
- HYNES, C. DENNIS (1957) ..... Biological Sciences  
B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., University of Florida, 1957. Professor.

- IANNCE, MICHAEL A. (1978) ..... Aeronautical and Mechanical Engineering  
B.S., Valparaiso University, 1961; M.S., University of California, Los Angeles, 1968; Ph.D., 1971. Associate Professor.
- IKENOYAMA, GEORGE K. (1964) ..... Architecture  
B.S., California State Polytechnic College, 1955; M.Arch., University of Hawaii, 1972. Professor. Registered Architect, California.
- IQBAL, M. ZAFAR (1979) ..... School of Business  
B.S., University of Nevada, Reno, 1969; M.B.A., Northern Illinois University, 1972; Ph.D., University of Nebraska, Lincoln, 1979. Professor and Associate Dean. Certified Public Accountant, Certificate in Management Accounting, Certified Internal Auditor.
- JACOBS, JAMES W. (1967) ..... Animal and Veterinary Science  
B.S., Oklahoma State University, 1967; M.S., California Polytechnic State University, 1975. Professor.
- JACOBSON, RALPH A. (1975) ..... Chemistry  
B.A., Montclair State College, 1962; Ph.D., Cornell University, 1966. Professor.
- JAMESON, GLORIA (1967) ..... English  
B.A., Texas Woman's University, 1941; M.A., Teacher's College, Columbia University, 1944; Ph.D., University of Texas, 1966. Professor.
- JAMIESON, LYNN M. (1980) ..... Physical Education and Recreation Administration  
B.A., Muskingum College, 1968; M.S., Indiana University, 1976; Rec.D., 1980. Assistant Professor.
- JANEWAY, ROBERT K. (1972) ..... Engineering Technology  
B.S., California State Polytechnic College, 1951; M.Engr., California Polytechnic State University, 1975. Professor. Registered Professional Engineer, California.
- JANKAY, PETER (1973) ..... Biological Sciences  
B.A., San Fernando Valley State University, 1966; M.S., 1969; Ph.D., University of California, Santa Barbara, 1973. Professor.
- JEFFERSON, DOROTHY (1982) ..... Student Academic Services  
B.A., Los Angeles State College, 1957; M.A., California Polytechnic State University, 1977. Academic Adviser.
- JENKINS, STARR (1961) ..... English  
B.A., University of New Mexico, 1948; M.A., Stanford University, 1959; Ph.D., University of New Mexico, 1972. Professor.
- JENNINGS, CHARLES W. (1968) ..... Art  
B.A., Wheaton College, 1966; M.A., M.F.A., Northern Illinois University, 1968. Associate Professor.
- JOHNSON, BOYD WALKER (1969) ..... Mathematics  
B.S., United States Naval Academy, 1951; M.S., North Carolina State College, 1956; Ph.D., North Carolina State University, 1963. Professor.
- JOHNSON, CORWIN M. (1961) ..... Crop Science  
B.S., State College of Washington, 1950; M.S., 1951; Ph.D., Cornell University, 1953. Professor and Department Head.
- JOHNSON, ERIC B. (1980) ..... Art  
B.S., University of Oregon, 1971; M.A., University of New Mexico, 1975; M.F.A., 1978. Assistant Professor.
- JOHNSON, ERIC V. (1969) ..... Biological Sciences  
B.A., Brown University, 1964; Ph.D., Cornell University, 1969. Professor.
- JOHNSON, MICHAEL W. (1980) ..... Economics  
B.A., Washington State University, 1970; M.A., Ph.D., Northwestern University, 1977. Assistant Professor.
- JOHNSON, RICHARD F. (1950) ..... Animal and Veterinary Science  
B.S., Iowa State College, 1942; M.S., State College of Washington, 1947. Professor.
- JOHNSON, WILLIAM V. (1966) ..... Music  
B.M.E., Indiana University, 1962; M.M., University of Michigan, 1966. Professor.

- JOHNSTON, THOMAS V. (1967) ..... School of Communicative Arts and Humanities  
Diploma of Teaching, New Zealand, 1948; Visual Arts Certificate, London University, 1950; D.A., Glasgow School of Art and Architecture, 1952. Professor and Associate Dean.
- JONES, DANE R. (1976) ..... Chemistry  
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Associate Professor.
- JONES, JACK B. (1969) ..... Education  
B.A., University of California, Santa Barbara, 1957; M.A., 1965; Ed.D., University of Arizona, 1970; U.S. Army Command and General Staff College, 1975. Professor.
- JONES, RICHARD L., LTC (1981) ..... Military Science  
B.S., United States Military Academy, 1966; M.S., New Mexico State University, 1974. Department Head.
- JORGENSEN, NANCY ANN (1968) ..... Counseling Services  
B.A., University of Hawaii, 1957; graduate study, Institute of Psychology, University of Paris, University of Hawaii, University of California at Santa Barbara, University of Nevada at Reno. Associate Professor and Counselor.
- KALATHIL, JAMES S. (1965) ..... Physics  
B.S., University of Madras, 1956; M.A., Southern Illinois University, 1963; Ph.D., University of Nevada, 1977. Professor.
- KANE, JOHN J. (1969) ..... Aeronautical and Mechanical Engineering  
B.S., U.S. Naval Academy, 1951; M.S., University of Pittsburgh, 1959; Ph.D., 1961. Professor.
- KANN, DAVID J. (1969) ..... English  
B.S., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Professor.
- KATEKARU, JAMES Y. (1969) ..... Chemistry  
B.S., University of Oregon, 1956; M.S., University of Arizona, 1961; Ph.D., University of Cincinnati, 1965. Professor.
- KATO, GORO C. (1981) ..... Mathematics  
B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. Assistant Professor.
- KAY, THOMAS D. (1958) ..... Engineering Technology  
B.S., Wayne State University, 1957; M.A., California State Polytechnic College, 1967. Professor.
- KEELING, DAVID L. (1975) ..... Chemistry  
B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. Associate Professor.
- KEEP, ROGER L. (1968) ..... Industrial Technology  
B.S., Brigham Young University, Hawaii, 1967; M.S., Stout State University, 1968; Ed.D., Utah State University, 1972. Professor. Licensed General Contractor.
- KEETCH, BRENT H. (1967) ..... English  
B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971. Professor and Interim Department Head.
- KEIF, RODNEY G. (1960) ..... Aeronautical and Mechanical Engineering  
B.S., Kansas State University, 1949; M.S., Kansas State University, 1975. Professor. Registered Professional Engineer, California and Oklahoma.
- KEIL, DAVID J. (1976) ..... Biological Sciences  
B.S., Arizona State University, 1968; M.S., 1970; Ph.D., Ohio State University, 1973. Associate Professor.
- KELLER, ELMO A., JR. (1963) ..... Computer Science and Statistics  
B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972. Professor.
- KELLERMAN, MARTIN A. (1968) ..... Chemistry  
B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966. Associate Professor.

- KELLEY, HELEN P. (1966) ..... Art  
B.P.A., Brooks Institute of Photography, Santa Barbara, 1966; M.S., California State College, San Jose, 1971. Professor.
- KELLOGG, WILLIAM C. (1983) ..... Agricultural Education  
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 1983. Assistant Professor.
- KENNEDY, EUEL W. (1974) ..... Mathematics  
B.S., East Central State College, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Professor.
- KENVIN, ROGER L. (1983) ..... Speech Communication  
A.B., Bowdoin College, 1949; M.A., Harvard University, 1956; M.F.A., Yale University, 1959; D.F.A., 1961. Professor.
- KERBO, HAROLD R. (1977) ..... Social Sciences  
B.A., University of Oklahoma, 1970; M.A., 1972; Ph.D., Virginia Polytechnic Institute and State University, 1975. Associate Professor.
- KERR, JOHN F. (1967) ..... English  
B.A., Arkansas State University, 1953; M.A., University of Michigan, 1956; Ph.D., University of Texas, 1964. Professor.
- KERSTEN, TIMOTHY W. (1971) ..... Economics  
B.A., Sacramento State College, 1967; M.A., University of Oregon, 1970; Ph.D., 1973. Professor.
- KESNER, BRIAN B. (1980) ..... Architecture  
B.Arch., University of California, Berkeley, 1967; M.Arch., 1978. Associate Professor.
- KIM, CHI SU (1974) ..... University Library  
B.A., Dan Kook University, Seoul, Korea, 1959; M.A., University of Oregon, 1967; M.L.S., 1969. Librarian.
- KLINE, KENNETH E. (1978) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1972; M.S., 1981. Assistant Professor. Licensed Landscape Contractor, California.
- KNABLE, ANTHONY E. (1973) ..... Natural Resources Management  
B.A., Blackburn College, 1965; M.A., Southern Illinois University, 1967; Ph.D., 1972. Professor.
- KNECHT, GEORGE N. (1973) ..... Biological Sciences  
B.S., Rutgers University, 1962; M.S., 1969; Ph.D., University of Arizona, 1975. Professor.
- KOBERG, DONALD J. (1962) ..... Architecture  
B.Arch., Tulane University, 1958; M.Arch., University of Washington, 1970. Professor and Interim Department Head. Registered Architect, Louisiana.
- KOHNEN, KEN (1983) ..... Architecture  
B.S., California State Polytechnic College, San Luis Obispo, 1966; B.Arch., 1967; M.Arch., Sheffield University, England, 1982. Associate Professor. Registered Architect, California.
- KOURAKIS, JOSEPH M. (1970) ..... City and Regional Planning  
B.A., University of Illinois, 1954; M.Arch., University of Illinois, 1957; M.C.R.P., University of California, Berkeley, 1961. Professor.
- KRANZDORF, RICHARD B. (1971) ..... Political Science  
A.B., University of Pennsylvania, 1958; M.A., 1959; M.A., University of California, Los Angeles, 1970; Ph.D., 1973. Professor.
- KREJSA, RICHARD J. (1968) ..... Biological Sciences  
B.S., Michigan State College, 1954; M.A., University of California, Los Angeles, 1958; Ph.D., University of British Columbia, Vancouver, 1964. Professor.
- KRIEGER, DANIEL E. (1971) ..... History  
B.A., San Jose State College, 1965; Ph.D., University of California, Davis, 1973. Professor.
- KUBINSKI, A. MARK (1975) ..... Biological Sciences  
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Associate Professor.

- LABHARD, LEZLIE A. (1967) ..... Child Development and Home Economics  
B.S., University of California, Davis, 1965; M.S., 1967. Associate Professor.
- LAKEMAN, SANDRA D. (1981) ..... Architecture  
B.S., University of Cincinnati, 1960; M.Arch., University of Oregon, 1977. Associate Professor. Registered Architect, Oregon.
- LAMB, STEPHAN R. (1979) ..... Housing  
B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975. Program Coordinator.
- LAMBERT, ROYCE L. (1969) ..... Soil Science  
B.S., Purdue University, 1964; M.S., 1966; Ph.D., 1969. Professor. Certified Professional Soil Scientist, Certified Professional Soil Erosion and Sediment Control Specialist.
- LAMOURIA, LLOYD H. (1965) ..... Agricultural Engineering  
B.S., Michigan State University, 1949; M.S., Iowa State University, 1950. Professor. Registered Agricultural Engineer, California.
- LANDRETH, JAMES R. (1956) ..... Business Affairs  
B.A., Mexico City College, 1954; M.B.A., Stanford University, 1956; additional graduate study, Claremont University College, California Polytechnic State University, San Luis Obispo. Director.
- LANDWEHR, ALFRED W. (1970) ..... English  
B.A. University of Missouri, 1963; M.A., 1964; Ph.D., 1970. Professor.
- LANG, MARTIN T. (1969) ..... Mathematics  
B.A., North Central College, Illinois, 1959; M.A., University of Kansas, 1963; Ph.D., University of Texas at Austin, 1973. Professor.
- LANGE, JOHN H. (1975) ..... Architecture  
B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Associate Professor. Registered Architect, California.
- LANT, KATHLEEN MARGARET (1983) ..... English  
B.A., University of Illinois, 1971; M.A., University of Oregon, 1975; Ph.D., 1982. Assistant Professor.
- LARSEN, STUART E. (1969) ..... Civil and Environmental Engineering  
B.S., University of Cincinnati, 1963; M.S., 1965; M.S., Arizona State University, 1969. Professor.
- LaSALLE, TIMOTHY J. (1974) ..... Dairy Science  
B.S., California State Polytechnic College, 1970; M.S., Virginia Polytechnic Institute and State University, 1972. Professor.
- LASCOLA, RUSSELL A. (1970) ..... Philosophy  
B.A., California State Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Professor.
- LASSANSKE, DANIEL E. (1974) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, San Luis Obispo, 1970; M.S., 1971. Associate Professor.
- LAZERE, DONALD P. (1977) ..... English  
B.A., Northwestern University, 1958; M.A., Columbia University, 1964; Ph.D., University of California, Berkeley, 1973. Professor.
- LEBENS, FRANK T. (1972-78) (1981) ..... Academic Affairs  
B.S., Iowa State University, 1964; M.B.A., California Polytechnic State University, 1972; M.A., 1975. Director of Operations.
- LEE, PETER Y. (1981) ..... Civil and Environmental Engineering  
B.S., National Taiwan University, 1961; M.S. Tulane University, 1965; Ph.D., 1968. Professor and Department Head. Registered Professional Engineer, Louisiana.
- LEE, THOMAS J. (1952) ..... Physical Education and Recreation Administration  
B.A., San Jose State University, 1949; M.A., Stanford University, 1950; M.A., Los Angeles State University, 1971. Professor.

- LEMMON, DON C. (1981) ..... Aeronautical and Mechanical Engineering  
B.S., University of Utah, 1943; M.S., Pennsylvania State University, 1948; Ph.D., Rensselaer Polytechnic Institute, 1964. Professor. Registered Professional Engineer, Massachusetts.
- LEONESIO, ROBERT B. (1972) ..... Metallurgical and Welding Engineering  
B.S., University of Massachusetts, 1963; M.S., Stanford University, 1964; Ph.D., Lehigh University, 1970. Associate Professor.
- LEONG, KINGSTON L. (1970) ..... Biological Sciences  
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.
- LEVENSON, HARVEY R. (1983) ..... Graphic Communications  
B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State University, 1968; Ph.D., University of Pittsburgh, 1980. Department Head.
- LEVISON, ROBERT L. (1969) ..... Education  
B.S., Southern Oregon College, 1963; M.Ed., University of Wyoming, 1966; Ed.D., New Mexico State University, 1972. Professor.
- LEWIS, GEORGE M. (1967) ..... Mathematics  
B.A., Stanford University, 1961; M.A., University of Southern California, 1964; Ph.D., 1970. Professor.
- LEWIS, RODGER C. (1977) ..... University Library  
B.A., University of Miami, 1950; M.A., 1953; M.A., Florida State University, 1957. Associate Librarian.
- LI, ELTON Y. (1982) ..... Management  
B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas Tech University, 1978; Ph.D., 1981. Associate Professor.
- LILJE, KARL D. (1981) ..... Engineering Technology  
B.S., Pennsylvania State University, 1957; M.S., New York University, 1960. Associate Professor. Registered Professional Engineer, Ohio.
- LINDVALL, JOHN R. (1973) ..... Business Administration  
B.A., Whitman College, 1962; M.B.A., Indiana University, 1971; Ph.D., 1973. Professor.
- LINSTRUM, HELEN M. (1970) ..... Academic Programs  
B.A., University of California, Los Angeles, 1961; M.A., California State Polytechnic College, San Luis Obispo, 1970. Assistant Admissions Officer.
- LINT, ROBERT G. (1967) ..... English  
A.B., University of Michigan, 1948; M.A., 1948, 1950; Ph.D., Ohio University, 1967. Professor.
- LITTLE, H. CLAY (1973) ..... Agricultural Management  
B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Associate Professor.
- LITTLE, WILLIAM T. (1983) ..... Foreign Languages  
B.A., California State College, Northridge, 1966; M.A., Indiana University, 1968; Ph.D., Washington University, 1973. Professor and Department Head.
- LOCASCIO, JAMES GASPARE (1981) ..... Aeronautical and Mechanical Engineering  
B.S., Newark College of Engineering, 1970; M.S., University of California, Santa Barbara, 1971. Associate Professor.
- LOE, NANCY E. (1982) ..... University Library  
B.A., Aurora College, 1975; M.S., M.A., Catholic University of America, 1977. Senior Assistant Librarian.
- LOH, ALICE C. (1974) ..... Landscape Architecture  
B.Arch., University of Manitoba, 1966; M.L.A., University of Oregon, 1972. Professor.
- LOH, LARRY (1979) ..... Architecture  
B.Arch., University of Manitoba, Canada, 1965; M.Arch. in U.D., Washington University, 1969. Professor. Registered Architect, Canada.
- LONG, DIANNE N. (1982) ..... Political Science  
B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan State University, 1977; Ph.D., 1982. Associate Professor.
- LOPEZ, AMBROCIO (1981) ..... Education  
B.S., Indiana State University, 1970; M.S., 1971; Ph.D., 1978. Assistant Professor.



- LOWRY, JOHN J. (1962) ..... Mathematics  
B.S., United States Military Academy, West Point, 1947; M.A., California State Polytechnic College, 1963; M.S., University of Illinois, 1967; Ed.D., Arizona State University, 1974. Professor.
- LUCAS, NANCY (1977) ..... English  
B.A., Incarnate Word College, 1964; M.A., University of Illinois, 1966; Ph.D., 1973. Associate Professor.
- LUCAS, ROBERT A. (1975) ..... Research Development  
A.B., John Carroll University, 1961; M.A., University of Illinois, 1963; Ph.D., 1970. Director.
- LUKES, THOMAS M. (1962) ..... Food Science  
B.S., San Jose State College, 1947; M.S., University of California, Berkeley, 1949. Professor.
- LUNA, GEORGE W. (1977) ..... Mathematics  
B.A., University of California, Santa Barbara, 1962; M.A., University of California, Los Angeles, 1965; Ph.D., University of Washington, 1973. Associate Professor.
- LUTHRA, SHAM S. (1972) ..... Computer Science and Statistics  
B.A., Punjab University, India, 1952; M.A., 1954; M.S., University of Alberta, Canada, 1969; Ph.D., University of Minnesota, 1974. Professor.
- LUTRIN, CARL E. (1970) ..... Political Science  
B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D., University of Missouri, 1971; additional graduate work, Stanford University. Professor.
- MAAS, DONALD K. (1976) ..... Education  
B.A., University of California, Los Angeles, 1966; M.Ed., State University of New York at Buffalo, 1969; Ed.D., 1971. Associate Professor.
- MACH, GEORGE R. (1954) ..... Mathematics  
B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951; Ph.D., Purdue University, 1963. Professor.
- MACIAS, RAY (1980) ..... Business Affairs  
B.A., University of Texas, 1964. Procurement and Support Services Officer.
- MADSEN, EUGENE F. (1974) ..... Student Health Services  
B.A., University of Rochester, 1949; M.D.C.M., McGill University; Internship, Southern Pacific Hospital, San Francisco, 1957; Residency, Contra Costa County Hospital, 1958; M.P.H., University of Hawaii, 1969. Physician.
- MAGER, HANS L. (1949) ..... Architectural Engineering  
M.S., Royal University of Technology, Stockholm, 1947; Doctorate, Technical University of Vienna, Austria, 1975. Professor. Registered Civil Engineer, California.
- MAKSODIAN, Y. LEON (1963) ..... Computer Science and Statistics  
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961; Ph.D., University of Minnesota, 1970. Professor.
- MALKIN, MICHAEL R. (1974) ..... Speech Communication  
A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor.
- MALLAREDDY, H. (1981) ..... Civil and Environmental Engineering  
B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Associate Professor. Registered Professional Engineer, Louisiana and Indiana.
- MALMBORG, FREDRICK B. (1969) ..... Aeronautical and Mechanical Engineering  
B.S., New York University, 1955; M.S., Columbia University, 1963. Associate Professor.
- MALONEY, KERRY A. (1983) ..... Financial Aid  
B.S., Bowling Green State University, 1980; M.A., Ohio State University, 1983. Counselor.
- MARK, WALTER R. (1972) ..... Academic Programs  
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Academic Program Planner. Registered Professional Forester, California.
- MARLIER, JOHN F. (1981) ..... Chemistry  
B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Assistant Professor.

- MARTINEZ, ANGELINA (1966) ..... University Library  
B.A., Inter-American University, San German, Puerto Rico, 1943; B.S., Louisiana State University, 1945; M.S., University of Illinois, 1957. Assistant Director.
- MARTINEZ, EVERARDO (1982) ..... Student Academic Services  
B.S., California Polytechnic State University, 1980; M.S., 1983. Academic Adviser.
- MASCY-RAMIREZ, CLARE (1981) ..... Financial Aid  
B.S., California Polytechnic State University, 1981. Counselor.
- MASON, ANTHONY K. (1980) ..... Industrial Engineering  
B.S., University of Southern California, 1959; M.S., 1963; Ph.D., 1967. Associate Professor.
- MAXWELL, JOHN C. (1978) ..... Chemistry  
B.S., Whitworth College, 1969; Ph.D., Colorado State University, 1979. Associate Professor.
- MAYO, EDWARD L. (1968) ..... History  
B.A., Claremont Men's College, 1959; M.A., 1966; Ph.D., Claremont Graduate School, 1969. Professor.
- McBRIDE, SUSAN L. (1979) ..... Education  
B.S., University of Akron, 1963; M.S., 1972; Ph.D., 1979. Associate Professor.
- McCALEB, DONALD L. (1962) ..... Public Affairs  
B.S., California State University, Los Angeles, 1958; M.A., California Polytechnic State University, 1970. Public Information Officer.
- McCOMBS, JOHN W. (1960) ..... Electronic and Electrical Engineering  
B.S., Clemson University, 1950; B.S., 1957; M.S., 1961; M.A., Northern Arizona University, 1971. Professor.
- McCORKLE, ROBERT E. (1962) ..... Agricultural Management  
B.S., California State Polytechnic College, 1960; M.S., University of California, 1962; additional graduate study, Oregon State University, University of Wisconsin. Professor.
- McDILL, JEAN M. (1973) ..... Mathematics  
B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971. Professor.
- McDONNELL, ROBERT A. (1975) ..... English  
B.A., St. John's University, 1951; M.A., University of Minnesota, 1954; Ph.D., 1958. Professor.
- McDOUGALL, MICHAEL E. (1972) ..... City and Regional Planning  
B.Arch., University of Hong Kong, 1955; graduate study, Architectural Association School, London, 1956-57; M.C.R.P., Cornell University, 1958. Professor.
- McGONAGILL, WILLARD L. (1967) ..... Architecture  
B.S., Colorado University, 1955; B.Arch., 1956. Associate Professor. Registered Architect, California.
- McINTIRE, ROBERT H. (1977) ..... Management  
B.S., Oklahoma State University, 1949; M.S., University of Colorado, 1960; Ph.D., University of Washington, 1968. Professor and Department Head.
- McKIBBIN, CARROLL R. (1974) ..... Political Science  
B.A., Drake University, 1959; M.A., 1960; Ph.D., University of Kansas, 1967. Professor.
- McKIM, PATRICK C. (1973) ..... Social Sciences  
B.A., University of California, Berkeley, 1967; M.A., 1970; Ph.D., 1973. Professor.
- McKINSTRY, JOHN A. (1968) ..... Social Sciences  
A.B., University of California, Los Angeles, 1961; A.M., University of Southern California, 1963; Ph.D., 1970. Professor.
- McLEOD, MALCOLM G. (1973) ..... Biological Sciences  
B.S., California Polytechnic College, Pomona, 1965; M.A., California State College, Fullerton, 1968; Ph.D., Arizona State University, 1973. Professor.
- McMORRAN, WAYNE E. (1962) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, 1960; M.S., New York University, 1962. Professor.
- McNEIL, ROBERT J. (1976) ..... Crop Science  
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Associate Professor.

- McRAE, GLENN G. (1963) ..... Counseling Services  
A.B., University of Tampa, 1949; M.Ed., University of Florida, 1954; D.Ed., 1959. Counselor.
- MENDENHALL, JOHN P. (1980) ..... Art  
B.F.A., University of Illinois, 1972; M.A., Stanford University, 1974. Associate Professor.
- MENG, SHIEN YI (1968) ..... Electronic and Electrical Engineering  
B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State University, 1958; Ph.D., Ohio State University, 1968. Professor.
- MENON, UNNY (1978) ..... Industrial Engineering  
A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972. Associate Professor.
- MEYERS, ROBERT E., JR. (1977) ..... Physical Education and Recreation Administration  
A.B., Stanford University, 1953; M.S., San Jose State University, 1965; D. Crim., University of California, Berkeley, 1974. Professor.
- MICHAUD, WILLIAM K. (1979) ..... Agricultural Management  
B.S., California State Polytechnic College, 1953; M.S., 1981. Associate Professor.
- MICHELFELDER, DIANE P. (1981) ..... Philosophy  
A.B., Bryn Mawr College, 1975; Ph.D., University of Texas, 1982. Assistant Professor.
- MILLER, ERNEST C. (1968) ..... Management  
B.A., University of Chicago, 1941; M.B.A., 1946; Ph.D., University of Denver, 1954. Professor.
- MILLER, HAROLD R. (1968) ..... Accounting  
B.S., University of Missouri, 1958; M.S., 1959. Associate Professor. Certified Public Accountant.
- MILLER, PAMELA COOK (1978) ..... Speech Communication  
B.A., Purdue University, 1968; M.A., 1970; Ph.D., University of Southern California, 1976. Associate Professor.
- MISIC, DRAGOSLAV M. (1970) ..... Civil and Environmental Engineering  
Diploma Engineer, University of Ljubljana, Yugoslavia, 1957; M.S., Ph.D., Northwestern University, 1963. Professor. Registered Professional Engineer, California.
- MOERMAN, KAREN SUE (1969) ..... Child Development and Home Economics  
B.S., University of Georgia, 1964; M.S., 1967. Associate Professor.
- MOIR, NEIL J. (1970) ..... Chemistry  
B.S., Lewis and Clark College, 1962; M.S., University of Oregon Medical School, 1966; Ph.D., 1968; Postdoctoral Fellow, Cornell University, 1968-1970. Professor.
- MONTECALVO, JOSEPH (1983) ..... Food Science  
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Assistant Professor.
- MONTGOMERY, DAVID H. (1956) ..... Biological Sciences  
B.S., California State Polytechnic College, 1954; M.A., College of the Pacific, 1956; additional graduate study, Friday Harbor Laboratories, University of Washington, University of California. Professor.
- MONTGOMERY, WAYNE R. (1982) ..... University Library  
A.B., University of California, Berkeley, 1977; M.L.S., University of California, Los Angeles, 1981. Assistant Librarian.
- MOORE, CAROLE M. (1980) ..... Counseling Services  
B.A., California Polytechnic State University, 1976; M.A., 1978. Career Information Specialist.
- MOREIRA, SIXTO EMILIO (1972) ..... Architecture  
B.S., University of Oklahoma, 1950; M.Arch., 1971; additional graduate study, University of California, Los Angeles. Professor. Registered Architect, California.
- MOREY, KRISHNAKUMAR S. (1970) ..... Child Development and Home Economics  
B.S., Nagpur University, India, 1955; M.S., 1958; M.S., U.C. Medical Center, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Professor.
- MORGAN, ANN (1980) ..... Child Development and Home Economics  
B.A., Texas Tech University, 1971; M.A., 1975; Ph.D., 1980. Assistant Professor.

- MORGAN, CONNIE S. (1983) ..... Student Health Services  
R.N., Cuesta College, 1980. Registered Nurse.
- MORGAN, DONALD E. (1968) ..... Industrial Engineering  
B.S., Oregon State College, 1940; M.S., Stanford University, 1962; Ph.D., 1963. Professor and  
Department Head. Registered Professional Engineer, California.
- MORRIS, DON M. (1957-62) (1969) ..... Education  
B.S., California State Polytechnic College, 1953; M.A., 1958; Ed.D., University of California,  
Los Angeles, 1968. Professor.
- MORRIS, NANCY C. (1977) ..... Agricultural Management  
B.S., St. Louis University, 1966; M.Acct., University of Arizona, 1975. Associate Professor.
- MORRISON, KENT E. (1979) ..... Mathematics  
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Associate Professor.
- MOSHER, LYNN S. (1974) ..... Industrial Technology  
B.S., State University College, Oswego, New York, 1963; M.Ed., St. Lawrence University,  
1966; Ed.D., Utah State University, 1972. Professor.
- MOTT, W. STEPHEN (1972) ..... Graphic Communications  
B.S., California State Polytechnic College, 1959; M.A., 1973. Professor.
- MOTTELER, ZANE C. (1982) ..... Computer Science and Statistics  
B.S., Stanford University, 1957; M.S., 1962; Ph.D., 1964; M.S., Michigan State University,  
1981; additional graduate study, University of Minnesota, University of New Mexico.  
Professor.
- MOTTMANN, JOHN (1974) ..... Physics  
B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972. Professor.
- MOY, CARL F. (1968) ..... Dairy Science  
B.S., University of Wisconsin, 1967. Associate Professor.
- MUELLER, JAMES R. (1980) ..... Mathematics  
B.A., University of Wisconsin, 1975; Ph.D., California Institute of Technology, 1982. Assistant  
Professor.
- MULDER, GEORGE (1968) ..... Counseling Services  
B.A., Long Beach State College, 1956; M.A., 1957; Ph.D., University of Southern California,  
1971. Counselor.
- MULLISEN, RONALD S. (1977) ..... Aeronautical and Mechanical Engineering  
B.S., California State Polytechnic College, 1969; M.Engr., 1976; Ph.D., Colorado State Uni-  
versity, 1983. Associate Professor. Registered Professional Engineer, California.
- MURPHY, JAMES L. (1981) ..... Industrial Technology  
B.A., Long Beach State College, 1971; additional graduate study, California Polytechnic State  
University, San Luis Obispo. Assistant Professor.
- MURPHY, PAUL F. (1970) ..... Mathematics  
A.B., Catholic University of America, 1961; M.A., Brooklyn College, 1966; Ph.D., Michigan  
State University, 1971. Professor and Interim Department Head.
- MURRAY, GEORGE T. (1978) ..... Metallurgical and Welding Engineering  
B.S., University of Kentucky, 1949; M.S., University of Tennessee, 1951; Sc.D., Columbia  
University, 1958. Professor and Interim Department Head.
- MURRAY, RANDALL L. (1977) ..... Journalism  
B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor and  
Department Head.
- NAFISI, AHMAD (1983) ..... Electronic and Electrical Engineering  
B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of Southern Califor-  
nia, 1977; Ph.D., 1983. Associate Professor.
- NAKAMURA, RAYMOND M. (1980) ..... Physical Education and Recreation  
Administration  
B.S., Northern Illinois University, 1965; M.S. 1967; M.S., DePaul University, 1980; Ph.D.,  
University of Toledo, 1974. Associate Professor.

- NAKAMURA, ROYDEN (1978) ..... Biological Sciences  
B.A., University of Hawaii, 1961; M.S., 1965; Ph.D., University of British Columbia, 1970.  
Associate Professor.
- NARETTO, EDWARD M. (1979) ..... Facilities Planning and Operations  
B.S., California State Polytechnic College, 1967. Director of Plant Operations.
- NASH, JAMES H. (1978) ..... Student Health Services  
B.A., Swarthmore College, 1947; M.D., Stanford University, 1953; Internship, U.S. Naval  
Hospital, Philadelphia; board certified American Board of Family Practice, 1969; recertified,  
1979; graduate study, University of San Francisco. Director.
- NEEL, PAUL R. (1962) ..... Architecture  
B.S., California State Polytechnic College, 1958; B.Arch., University of Southern California,  
1962; M.Arch., University of Sheffield, 1969. Professor. Registered Architect, California.
- NEELANDS, JAMES G. (1957) ..... School of Science and Mathematics  
B.S., California State Polytechnic College, 1956; graduate study, University of Washington.  
Equipment Technician.
- NELSON, LAWRENCE H. (1972) ..... Aeronautical and Mechanical Engineering  
B.S., California Institute of Technology, Pasadena, 1958; M.S., University of California,  
Davis, 1968; Ph.D., 1972. Professor.
- NELSON, LINDEN L. (1970) ..... Psychology  
B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970.  
Associate Professor.
- NELSON, RICHARD F. (1960) ..... Biological Sciences  
B.S., Brigham Young University, 1955; M.S., 1957; Ph.D., State University of Iowa, 1960.  
Professor.
- NIKU, SAEED (1983) ..... Aeronautical and Mechanical Engineering  
B.S., Tehran Polytechnic University, 1975; M.S., Stanford University, 1976; Ph.D., Univer-  
sity of California, Davis, 1982. Associate Professor.
- NIELSEN, KEITH E. (1959) ..... Speech Communication  
B.A., Alma College, 1953; M.A., Stanford University, 1959; M.A., California State Polytech-  
nic College, San Luis Obispo, 1966; Ph.D., Michigan State University, 1970. Professor.
- NILES, PHILIP W.B. (1967) ..... Aeronautical and Mechanical Engineering  
B.S., University of California, 1957; M.S., 1958; additional graduate study, University of  
California, Los Angeles. Professor.
- NIU, SHIEN HWEI (1969) ..... University Library  
B.A., National Taiwan University, 1951; M.A., Bucknell University, 1957; additional gradu-  
ate study, University of Wisconsin; M.A., Indiana University, 1967. Associate Librarian.
- NOBLE, MICHAEL S. (1979) ..... Business Administration  
B.A., University of Arizona, 1967; M.B.A., 1973; D.B.A., Arizona State University, 1978,  
Associate Professor.
- NOBLE, WILLIAM E. (1973) ..... Ornamental Horticulture  
B.S., University of Maryland, 1964; M.S., 1969; Ph.D., University of Florida, 1974. Professor.
- NORDQUIST, RAYMOND E. (1964) ..... Architecture  
B.S., Montana State College, 1950; M.Arch., University of California, Berkeley, 1971. Profes-  
sor. Registered Architect, Montana.
- NOYES, O. ROBERT (1974) ..... Food Science  
B.A., Norwich University, 1963; M.Ed., University of Georgia, 1970; Ph.D., 1974. Professor.
- NULMAN, DENNIS M. (1977) ..... Education  
B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California,  
1977. Associate Professor.
- NUTTER, DAVID E. (1974) ..... Accounting  
A.B., West Virginia University, 1954; M.B.A., Indiana University, 1958; D.B.A., University  
of Southern California, 1974. Professor. Certified Public Accountant.
- NYE, MARLENE (1975) ..... Student Health Services  
B.S., California State Polytechnic College, San Luis Obispo, 1967. Clinical Laboratory  
Technologist.

- OCHYLSKI, MARSHALL E. (1978) ..... Ornamental Horticulture  
B.A., University of Michigan, 1970; M.L.A., 1973. Associate Professor. Licensed Landscape Architect, California.
- O'CONNOR, EUGENE L. (1964) ..... Business Administration  
B.S., St. Louis University, 1957; M.S., 1963. Professor.
- ODDO, ANTHONY P. (1981) ..... Intercollegiate Athletics  
B.S., Fresno State University, 1972; M.A., California Lutheran College, 1978. Coach.
- OFFERMANN, GENE P. (1970) ..... Crop Science  
B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis, 1970. Professor.
- O'FLAHERTY, SUSAN (1977) ..... Financial Aid  
B.A., Adelphi University, 1972; M.A., California Polytechnic State University, 1981. Assistant Director.
- OKABAYASHI, VIRGINIA B. (1982) ..... Student Health Services  
B.S., University of Wisconsin, 1972. Pharmacist. Licensed Pharmacist, California and Wisconsin.
- O'KEEFE, TIMOTHY G. (1983) ..... Natural Resources Management  
B.S., New York State College of Forestry, 1955; M.F., 1957; M.A., Northern Arizona University, 1973; Ph.D., 1977. Associate Professor.
- OLSEN, BARTON C. (1968) ..... History  
B.A., University of Utah, 1955; M.A., 1966; Ph.D., 1968. Professor.
- O'NEIL, THOMAS D. (1973) ..... Mathematics  
B.A., San Diego State College, 1966; M.A., 1968; Ph.D., University of Wyoming, 1969. Professor.
- O'NEILL, GERTRUDIS M. (1972) ..... University Library  
B.A., Inter-American University, Puerto Rico, 1955; M.F.A., University of Cincinnati, 1962; M.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Senior Assistant Librarian.
- ORTH, MICHAEL P. (1967-69) (1970) ..... English  
B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State University, 1963; Ph.D., Claremont Graduate School, 1974. Professor.
- ORTIZ, L. ALEXANDER (1982) ..... Civil and Environmental Engineering  
B.S., University of Colorado, 1977; M.S., California Institute of Technology, 1978; Ph.D., 1982. Assistant Professor.
- ORTIZ, MARIA E. (1972) ..... Biological Sciences  
B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Woman's University, 1973. Professor.
- OSBALDESTON, ROGER J. (1972) ..... Landscape Architecture  
Diploma in Architecture, School of Architecture, Nottingham, England, 1957; M.L.A., University of Pennsylvania, 1961. Associate Professor.
- O'TOOLE, FREDERICK J. (1972) ..... Philosophy  
B.A., University of California, Los Angeles, 1966; M.A., University of California, Davis, 1968; Ph.D., 1972. Associate Professor.
- OZAWA, KENNETH S. (1963) ..... Physics  
B.S., John Carroll University, 1959; M.S., 1960; Ph.D., University of Kansas, 1975. Professor.
- PAGE, PERRYMAN L. (1963) ..... University Library  
B.A., University of Mississippi; M.S., Louisiana State University, 1963. Associate Librarian.
- PAPAKYRIAZIS, ARTEMIS (1982) ..... Economics  
B.A., Athens School of Political Science, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., University of California, Riverside, 1983. Assistant Professor.
- PAPAKYRIAZIS, PANAGIOTIS A. (1971) ..... Economics  
B.A., Athens School of Economics and Business Science, 1964; Ph.D., University of California, San Diego, 1974. Professor.

- PARKER, FRANCES J. (1980) ..... Child Development and Home Economics  
B.S., California State College, Northridge, 1965; M.S., California State College, Long Beach, 1967; Ph.D., Ohio State University, 1969. Professor and Department Head.
- PARKER, LEE R. (1974) ..... Biological Sciences  
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Associate Professor.
- PATTERSON, WILLIAM B. (1977) ..... Aeronautical and Mechanical Engineering  
B.S., U.S. Naval Academy, 1962; M.S., Air Force Institute of Technology, 1972. Associate Professor.
- PAUTZ, ROLAND K. (1959) ..... Poultry  
B.S., Oregon State College, 1957; M.S., Oregon State University, 1968. Professor.
- PECK, ROXY L. (1979) ..... Computer Science and Statistics  
B.A., University of California, Riverside, 1972; Ph.D., 1979. Associate Professor.
- PEDERSEN, MARY E. (1981) ..... Child Development and Home Economics  
B.A., University of California, Santa Barbara, 1973; M.S., University of California, Los Angeles, 1976; Ph.D., 1980. Associate Professor.
- PENDSE, PRATAPSIHA C. (1966) ..... Biological Sciences  
B.S., Bombay University, 1947; M.S., Poona University, 1951; M.S., Utah State University, 1959; Ph.D., 1965; additional graduate study, Stanford University, Yale University, McGill University, Johns Hopkins University. Professor.
- PERELLO, DOMINIC B. (1954) ..... Economics  
A.B., University of California, Santa Barbara College, 1951; M.S., University of Wisconsin, 1952; additional graduate study, University of California, Los Angeles. Professor.
- PEREZ, MARINA E. (1975) ..... Student Health Services  
B.S., University of the Philippines, 1961. Nurse Practitioner.
- PERLICK, WALTER W. (1979) ..... Business Administration  
B.S., M.S., Northern Illinois University, 1965; Ph.D., Pennsylvania State University, 1973. Professor and Department Head.
- PERRYMAN, ELIZABETH K. (1972) ..... Biological Sciences  
B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., University of Arizona, 1972. Professor.
- PETERS, RALPH A. (1969) ..... Physics  
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Fordham University, 1967. Professor.
- PETERSON, JAMES J. (1964) ..... English  
B.A., Bradley University, 1952; M.A., University of Pennsylvania, 1956; additional graduate study, Temple University, University of Pennsylvania. Associate Professor.
- PETERSON, JOHN D. (1981) ..... Engineering Technology  
B.S., United States Naval Academy, 1951; M.S., University of Southern California, 1957. Associate Professor. Registered Professional Engineer, California.
- PEZO-SILVA, ARMANDO A. (1973) ..... Student Academic Services  
B.S., California State Polytechnic College, 1970; M.A., 1974; M.S., 1979. Director.
- PHAKLIDES, WILLIAM J. (1963) ..... Engineering Technology  
B.S., California State Polytechnic College, 1956; graduate study, Montana State University. Professor. Registered Professional Engineer, California.
- PHILBIN, B. JUDITH (1983) ..... Associated Students, Inc.  
B.S., California Polytechnic State University, 1976. ASI Information Director.
- PHILLIPS, DENNIS R. (1976) ..... Chemistry  
B.A., Whitman College, 1971; Ph.D., University of Hawaii, 1976. Associate Professor.
- PHILLIPS, JOHN C. (1974) ..... Crop Science  
B.S., Washington State University, 1967; M.S., Colorado State University, 1969; Ph.D., Oregon State University, 1974. Professor.

- PHILLIPS, PETER K. (1968) ..... Facilities Planning and Operations  
B.S., California State Polytechnic College, 1959. Architectural Coordinator.
- PHILLIPS, WILLIAM R. (1957) ..... Architectural Engineering  
B.Arch., University of Southern California, 1952; M.Arch., University of Hawaii, 1971.  
Professor. Registered Architect, California.
- PIEL, DANIEL D. (1980) ..... Art  
B.A., Yale University, 1951; B.F.A., Pratt Institute, 1954; M.S., 1971. Associate Professor.
- PIEPER, JANET L. (1984) ..... Personnel and Employee Relations  
B.S., University of Nebraska, 1954; M.A., 1969; Ph.D., 1976. Director.
- PIERCE, DAVID R., JR. (1981) ..... Construction Management  
B.S., Virginia Polytechnic Institute, 1963; M.B.A., University of West Florida, 1971. Profes-  
sor and Department Head.
- PIETERS, LEON W. (1982) ..... Student Health Services  
B.A., University of California, 1955; M.D., University of California, Los Angeles, 1960.  
Physician.
- PILLSBURY, NORMAN H. (1974) ..... Natural Resources Management  
B.S., Humboldt State College, 1968; M.S., 1972; Ph.D., Colorado State University, 1976.  
Professor and Interim Department Head. Registered Professional Forester, California.
- PINARD, LEO W., II (1970) ..... Social Sciences  
B.A., University of Santa Clara, 1962; M.A., University of Notre Dame, 1963; Ph.D., 1971.  
Professor.
- PIPER, CURTIS DEAN (1964) ..... Soil Science  
B.A., W. J. Bryan University, 1953; M.S., Michigan State University, 1959; Ph.D., 1967.  
Professor.
- PIPPIN, LOUIS D. (1970) ..... Education  
B.S., West Texas State College, 1952; M.Ed., 1956; Ed.D., North Texas State University, 1970.  
Professor.
- PLUMB, TIMOTHY R. (1981) ..... Natural Resources Management  
B.S., Oregon State University, 1954; M.S., University of California, Berkeley, 1959; Ph.D.  
University of California, Riverside, 1970. Associate Professor.
- PLUMMER, WILLIAM E. (1979) ..... Animal and Veterinary Science  
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979.  
Associate Professor.
- POHL, JENS G. (1973) ..... Architecture  
B.Arch., University of Melbourne, Australia, 1964; M.Bldg.Sci., University of Sydney, 1967;  
Ph.D., 1970. Professor. Registered Architect, Australia.
- POKORNY, CORNEL K.E. (1983) ..... Computer Science and Statistics  
M.S., Technical University Vienna, Austria, 1973; Tech.D., 1977. Associate Professor.
- POLING, JOHN E. (1976) ..... Physics  
B.A., University of Chicago, 1965; M.S., University of Iowa, 1969; Ph.D., 1975. Associate  
Professor.
- POTTS, PHILIP L., SR. (1982) ..... Poultry  
B.S.A., University of Georgia, 1972; M.S., 1974; Ph.D., 1981. Associate Professor and Depart-  
ment Head.
- POURAGHABAGHER, A. REZA (1979) ..... Industrial Engineering  
B.S., University of Colorado, 1972; M.S., University of California, 1973; Ph.D. University of  
Iowa, 1977. Associate Professor. Professional Engineer, California.
- PRESTON, WILLIAM L. (1980) ..... Social Sciences  
B.A., California State College, Fresno, 1971; M.A., 1973; Ph.D., University of Oregon, 1979.  
Associate Professor.
- PRICE, CARROLL D., II (1981) ..... University Development  
B.A., Pennsylvania State University, 1963; M.S., 1972. Director.



- PRICE, D. JOHN (1957) ..... Aeronautical and Mechanical Engineering  
National Certificate in M.E., Dudley and Staffordshire Technical College, 1950; B.S., California State Polytechnic College, 1954. Associate Professor.
- PRITCHARD, EILEEN ELLEN (1973) ..... University Library  
B.A., California State College, Chico, 1961; Ph.D., University of Kansas, 1967; M.L., Kansas State Teachers College, 1972. Associate Librarian.
- PROCTOR, ANDREW J. (1973) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic College, 1970; M.S., 1971; Ph.D., University of Utah, 1978. Assistant Professor.
- PROCTOR, CAROLYN (1973) ..... Placement Center  
B.S., Kansas State University, 1972; M.A., California Polytechnic State University, 1975. Career Placement Adviser.
- PUNCHES, GERALD N. (1971) ..... Academic Programs  
B.A., Western Washington State College, 1970; M.Ed., 1971; additional graduate study, University of California, Santa Barbara. Registrar.
- QUINLAN, CHARLES W. (1966) ..... Architecture  
B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor. Registered Architect, California.
- RABE, PETER (1967) ..... Psychology  
B.A., Ohio State University, 1943; M.A., Western Reserve University, 1948; Ph.D., 1949. Associate Professor.
- RADEMAKER, PIERRE (1972) ..... Art  
B.A., California State College, Long Beach, 1970; M.F.A., Syracuse University, New York, 1978. Associate Professor.
- RAILEY, JIMMY H. (1977) ..... Physical Education and Recreation Administration  
B.S., Murray State University, 1957; M.S., Indiana University, 1959; D.P.E., 1969. Professor and Department Head.
- RANDAZZO, ANTHONY JAMES (1977) ..... Industrial Technology  
B.A., San Jose State College, 1965; M.A., 1968; Ph.D., Washington State University, 1976. Associate Professor.
- RATCLIFFE, RONALD V. (1963) ..... Music  
B.A., University of Washington, 1956; M.M., University of Southern California, 1958. Professor.
- RATHBUN, LARRY P. (1970) ..... School of Agriculture and Natural Resources  
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1967; Ph.D., Ohio State University, 1974. Professor and Associate Dean.
- RAWLINGS, DON (1980) ..... Mathematics  
B.S., Arizona State University, 1974; M.A., University of California, San Diego, 1976; Ph.D., 1978. Associate Professor.
- REGAN, RONALD D. (1977) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1951; M.A., Los Angeles State College, 1959; additional graduate study, University of Southern California. Professor and Department Head.
- REIF, GARY D. (1967) ..... Dairy Science  
B.S., Kansas State University, 1962; M.S., University of Nebraska, 1964; Ph.D., Iowa State University, 1967. Professor.
- REYNOLDS, ROBERT G. (1963) ..... Art  
B.P.A., Art Center College of Design, Los Angeles, 1962; M.A., California Polytechnic State College, San Luis Obispo, 1970. Professor.
- REYNOSO, WENDY DEMKO (1978) ..... Student Academic Services  
B.A., California Polytechnic State University, 1978; M.A., 1983. Writing Skills Coordinator.
- RICE, MARILYNN F. (1977) ..... Education  
A.B., University of California, Los Angeles, 1960; M.Ed., California State University, Northridge, 1969; Ph.D., University of California, Santa Barbara, 1977. Associate Professor.

- RICE, ROBERT P. (1976) ..... Ornamental Horticulture  
B.S., University of Georgia, 1973; M.S., 1974; Ph.D. Michigan State University, 1977. Associate Professor.
- RICE, THOMAS J., JR. (1981) ..... Soil Science  
B.S., University of Wisconsin-Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State University, 1981. Assistant Professor. Certified Professional Soil Scientist.
- RICE, WALTER E. (1964) ..... Economics  
B.A., San Francisco State College, 1960; M.A., 1963; M.A., Claremont Graduate School, 1970; Ph.D., 1973. Professor and Interim Department Head.
- RICHARDS, THOMAS L. (1969) ..... Biological Sciences  
B.S., California State College, Long Beach, 1964; M.A., 1966; Ph.D., University of Maine, 1969. Professor.
- RICKARD, HERMAN E. (1959-68) (1969) ..... Dairy Science  
B.S., Ohio State University, 1950; M.S., 1954; Ph.D., 1958. Professor.
- RIEDLSPERGER, MAX E. (1969) ..... History  
B.A., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado, 1969. Professor.
- RIENER, KENNETH D. (1983) ..... Business Administration  
B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor.
- RIFE, WILLIAM C. (1977) ..... Chemistry  
B.A., North Central College, 1956; Ph.D., University of Illinois, 1960. Professor and Department Head.
- RIGGINS-PIMENTEL, RHONDA L. (1972) ..... Biological Sciences  
B.S., Austin Peay State College, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Associate Professor.
- RIHAL, SATWANT S. (1969) ..... Architectural Engineering  
B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico, 1969. Professor. Registered Civil Engineer, California.
- RISSE, JOSEPH C. (1982) ..... Business Affairs  
B.A., Humboldt State College, 1971; M.A., 1978. Housing Manager.
- ROACH, DAVID M. (1966) ..... Physics  
B.S., South Dakota School of Mines and Technology, 1961; M.S., 1963; Ph.D., Oregon State University, 1974. Professor.
- ROBINSON, MICHAEL R., MAJ (1982) ..... Military Science  
B.S., California State Polytechnic College, 1970; M.S.C.E., Stanford University, 1979; D.E., 1979. Registered Professional Engineer, Nevada.
- ROCKMAN, ILENE F. (1975) ..... University Library  
B.A., University of California, Los Angeles, 1972; M.S., University of Southern California, 1974; M.A., California Polytechnic State University, 1978. Associate Librarian.
- RODGER, JAMES A. (1976) ..... Construction Management  
B.Bldg.Cstr., University of Florida. 1970; M.S., 1977. Associate Professor.
- ROEST, ARYAN I. (1955) ..... Biological Sciences  
B.S., University of Virginia, 1945; B.S., Oregon State College, 1948; M.S., 1949; Ph.D., 1954. Professor.
- ROGALLA, JOHN A. (1959) ..... Agricultural Management  
B.S., California State Polytechnic College, 1956; M.S., Cornell University, 1958; Ph.D., 1968. Professor.
- ROGERS, JOHN M. (1970) ..... Computer Science and Statistics  
B.S., Marion College, 1962; M.S., Kansas State University, 1966; Ph.D., Virginia Polytechnic Institute and State University, 1975. Associate Professor.
- ROGERS, ROBERT L. (1974) ..... Engineering Technology  
B.S., California Maritime Academy, 1969; M.S., Stanford University, 1972. Associate Professor. Registered Professional Engineer, California.

- ROGERS, ROLF E. (1975) ..... Management  
M.A., University of Washington, 1968; Ph.D., 1970. Professor.
- ROLLINGS, DAVID R. (1968) ..... English  
A.B., University of Louisville, 1948; M.A., University of Michigan, 1949; additional graduate study, University of Michigan. Assistant Professor.
- ROSEN, ARTHUR Z. (1953) ..... Physics  
A.B., University of California, 1941; Ph.D., 1952. Professor.
- ROSENBERG, ROBERT L. (1970) ..... History  
B.A., Stanford University, 1944; M.A., University of Washington, 1964; Ph.D., 1971. Associate Professor.
- ROSENFELD, ALLEN E. (1982) ..... Agricultural Management  
B.S., Pennsylvania State University, 1969; M.S., California Polytechnic State University, 1978. Assistant Professor.
- ROSENMAN, MONA G. (1971) ..... English  
B.A., University of Michigan, 1955; M.A., Case-Western Reserve University, 1960; Ph.D., Kent State University, 1970. Professor.
- ROSENTHAL, BIANCA (1971) ..... Foreign Languages  
B.S., University of Washington, 1952; M.A., 1966; Ph.D., 1970. Professor.
- ROSKE, MILDRED E. (1967) ..... Child Development and Home Economics  
B.A., University of California, Los Angeles, 1955; M.A., 1958; Ph.D., University of Oregon, 1975. Professor.
- RUEHR, THOMAS A. (1974) ..... Soil Science  
B.S., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State University, 1976. Professor.
- RUGGLES, PHILIP K. (1966-67) (1971) ..... Graphic Communications  
B.S., West Virginia Institute of Technology, 1965; M.S., South Dakota State University, 1966. Professor.
- RUSSELL, CRAIG H. (1982) ..... Music  
B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981. Assistant Professor.
- RUSSELL, JOHN G. (1968) ..... Music  
A.B., California State University, Fresno, 1959; M.A., California State University, Chico, 1968. Professor.
- RUTHERFORD, ROBERT T. (1974) ..... Animal and Veterinary Science  
B.S., University of California, Davis, 1970; M.S., California Polytechnic State University, 1976. Associate Professor.
- RYAN, KATHLEEN A. (1981) ..... Psychology  
B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980. Assistant Professor.
- RYAN, L. DIANE (1974) ..... Financial Aid  
B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1976. Assistant Director.
- SAAM, PATRICIA (1966) ..... Child Development and Home Economics  
B.S., College of St. Catherine, 1950; M.S., California Polytechnic State University, 1973. Associate Professor.
- SABOL, JOSEPH E. (1972) ..... Agricultural Education  
B.S., Fresno State College, 1963; M.Ed., University of California, 1965; Ph.D., Colorado State University, 1976. Professor and Interim Department Head.
- SABTO, JACOB C. A. (1968) ..... Electronic and Electrical Engineering  
B.E.E., Cairo University, 1948; Ingenieur Radio-ESE, Ecole Supérieure D'Electricite, Paris, 1951; E.E., Columbia University, 1959; additional graduate study, New York University. Professor.

- SAENZ, RICHARD A. (1980) ..... Physics  
A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977.  
Assistant Professor.
- SALO, GLENN W. (1955) ..... Agricultural Engineering  
B.S., Montana State College, 1950; M.S., University of Idaho, 1955; additional graduate work,  
University of California, Davis. Professor. Registered Civil Engineer, California.
- SALTZMAN, JUDY D. (1975) ..... Philosophy  
B.A., San Jose State University, 1963; M.A., University of California, Berkeley, 1965; M.A.,  
1973; Ph.D., University of California, Santa Barbara, 1977; Fulbright scholar, Freie Univer-  
sität, Berlin, 1970-71. Associate Professor.
- SANCHEZ, DAVID J. (1970) ..... Education  
B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa  
Barbara. Associate Professor and Coordinator of Ethnic Studies.
- SANDERS, MARK I. (1983) ..... Student Health Services  
B.A., Grambling College, 1973; M.D., Tulane University, 1977. Physician.
- SANDERSON, JAMES D. (1967) ..... Intercollegiate Athletics  
A.B., Fresno State College, 1962; M.S., California State Polytechnic College, 1969. Coach.
- SANDLIN, DORAL R. (1969) ..... Aeronautical and Mechanical Engineering  
B.S., U.S. Naval Academy, 1954; M.S., Air Force Institute of Technology; Ph.D., University  
of Arizona, 1972. Professor.
- SCHAFFNER, DAVID J. (1972) ..... Agricultural Management  
B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970;  
M.S., California Polytechnic State University, 1978; Ph.D., Golden Gate University, 1980.  
Professor.
- SCHLEICHER, HELMUT L. (1970) ..... Construction Management  
B.A., Kaiser-Friedrich Mannheim College, 1936; M.S., Technical University, Munich, 1945;  
Ph.D., University of Munich, 1948; additional graduate study, University of Hawaii.  
Professor.
- SCHMIDT, RICHARD J. (1979) ..... Accounting  
B.S., University of Utah, 1961; M.B.A., 1962; Ph.D., University of Santa Clara, 1979. Profes-  
sor and Department Head. Certified Public Accountant, Certificate in Management Ac-  
counting, Certified Internal Auditor.
- SCHULTZ, NED W. (1976) ..... Child Development and Home Economics  
B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976.  
Associate Professor.
- SCHUMANN, THOMAS G. (1971) ..... Physics  
B.S., California Institute of Technology, 1958; M.A., University of California, Berkeley, 1960;  
Ph.D., 1965. Associate Professor.
- SCHWARTZ, KENNETH E. (1952) .. School of Architecture and Environmental Design  
B.Arch., University of Southern California, 1952; graduate study, Pennsylvania State Uni-  
versity, Rensselaer Polytechnic Institute, University of Manchester, England. Professor and  
Associate Dean. FAIA.
- SCOTT, JACK F. (1967) ..... Agricultural Management  
B.S., California State Polytechnic College, 1961; M.A., 1967. Professor.
- SCOTT, PAULA ROSEMARY (1973) ..... University Library  
B.A., University of California, Los Angeles, 1965; M.L.S., 1966; M.A., Monterey Institute of  
Foreign Studies, 1974. Associate Librarian.
- SCOTTO, KENNETH C. (1970) ..... Animal and Veterinary Science  
B.S., California State Polytechnic College, San Luis Obispo, 1966; M.S., University of Ne-  
vada, 1969. Associate Professor.
- SCRIVEN, TALMAGE ERNEST (1980) ..... Philosophy  
B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern Califor-  
nia, 1980. Assistant Professor.
- SEABERG, DUANE O. (1965) ..... Agricultural Management  
B.S., California State Polytechnic College, 1960; M.A., 1963. Professor.

- SEDLETZKY, MARCEL E. (1972) ..... Architecture  
Candidate of Architecture Technical University, Graz, Austria, 1949; B.S., University of Cincinnati, 1952; M.Arch., University of California, Berkeley, 1973. Professor. Registered Architect, California.
- SEIM, EDWIN C. (1978) ..... Soil Science  
B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Associate Professor.
- SENNETT, ROBERT EARL (1970) ..... Civil and Environmental Engineering  
B.S., University of Pennsylvania, 1959; M.S., 1961; Ph.D., 1963. Professor. Registered Professional Engineer, California.
- SETTLE, ALLEN K. (1970) ..... Political Science  
B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Professor.
- SHAFFER, RICHARD A. (1974) ..... Social Sciences  
B.A., Stanislaus State College, 1971; M.A., University of Notre Dame, 1974; Ph.D., 1975. Professor.
- SHAH, RAMESH T. (1969) ..... Aeronautical and Mechanical Engineering  
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermetallbau, Magdeburg, East Germany, 1959. Professor. Registered Professional Engineer, California.
- SHANI, ABRAHAM B. (1983) ..... Management  
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Associate Professor.
- SHANK, CAROLYN B. (1974) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Associate Professor.
- SHARP, HARRY, JR. (1975) ..... Speech Communication  
A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor and Department Head.
- SHEIK, HABIB (1967) ..... English  
B.S., California State University, Fresno, 1959; A.B., 1960; M.A., California State Polytechnic College, 1961; M.A., University of California, Los Angeles, 1966; Ph.D., University of Nebraska, 1979. Associate Professor.
- SHELTON, MARK D. (1982) ..... Crop Science  
B.S., University of Idaho, 1977; M.S., Purdue University, 1980. Assistant Professor.
- SHEPPEL, PAM M. (1983) ..... Student Health Services  
B.A., University of Southern California, 1979; M.P.H., University of California, Los Angeles, 1981. Health Educator.
- SHIERS, ALDEN F. (1975) ..... Economics  
B.S., University of Maine, 1967; Ph.D., University of California, Santa Barbara, 1977. Associate Professor.
- SILVER, GORDON A. (1964) ..... Physics  
B.S., University of California, Los Angeles, 1959; M.S., 1961; additional study, University of California, Berkeley. Professor.
- SILVERS, ARTHUR H. (1976) ..... Architecture  
B.Arch., University of Southern California, 1959; M.A., California Polytechnic State University, San Luis Obispo, 1978. Professor. Registered Architect, California.
- SILVESTRI, MICHAEL G. (1978) ..... Chemistry  
B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977. Associate Professor.
- SIMEK, JAN. W. (1977) ..... Chemistry  
B.A., Kalamazoo College, 1970; M.S., Stanford University, 1971; Ph.D., 1975. Associate Professor.

- SIMMONS, JAMES E. (1966) .....English  
B.A., University of California, Santa Barbara, 1959; M.A., University of Wisconsin, 1960;  
Ph.D., 1966. Professor.
- SLEM, CHARLES M. (1975) ..... Psychology  
B.A., University of California, Los Angeles, 1968; M.A., 1972; Ph.D., Wayne State University, 1975. Associate Professor and Interim Department Head.
- SMELAND, CHRISTIAN O. (1982) .....Intercollegiate Athletics  
B.A., California Polytechnic State University, San Luis Obispo, 1974; M.A., University of Colorado, 1976. Coach.
- SMIDT, ROBERT K. (1978) ..... Computer Science and Statistics  
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976. Associate Professor.
- SMITH, DALE A. (1973) .....Animal and Veterinary Science  
B.S., University of California, Davis, 1971; D.V.M., 1973. Professor.
- SMITH, DOUGLAS B. (1977) .....English  
B.A., Johns Hopkins University, 1969; M.A., Fairfield University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979. Associate Professor.
- SMITH, GERALD L. (1980) .....Landscape Architecture  
B.S., Iowa State University, 1961; M.L.A., University of Illinois, 1968. Professor and Department Head.
- SMITH, KENT D. (1981) ..... Computer Science and Statistics  
B.A., University of Utah, 1967; M.S., Air Force Institute of Technology, 1969; M.S., University of California, Riverside, 1979; Ph.D., 1981. Associate Professor.
- SMITH, NELSON L., III (1962) ..... Industrial Technology  
B.S., Lowell Technological Institute, 1960; M.S., 1962; additional graduate study, University of Iowa. Professor.
- SMITH, STANLEY B. (1978) ..... Business Administration  
B.S., University of Utah, 1953; M.B.A., 1962; D.B.A., University of Southern California, 1978. Professor.
- SMITH, TERRY L. (1980) .....Soil Science  
B.S., University of Nebraska-Lincoln, 1972; M.S., 1975; Ph.D., Iowa State University, 1980. Assistant Professor.
- SNETSINGER, JOHN G. (1970) ..... History  
A.B., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1966; Ph.D., Stanford University, 1969; additional graduate study, Stanford School of Law. Professor.
- SNYDER, DAVID H. (1970) ..... Academic Programs  
B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975. Admissions Officer.
- SOMAYAJI, SHAN (1981) ..... Architectural Engineering  
B.S., Karnataka Regional Engineering College, India, 1968; M.S., South Dakota School of Mines and Technology, 1975; Ph.D., University of Illinois, 1979. Associate Professor. Registered Civil Engineer, California.
- SOMPPI, SUSAN (1978) .....Student Academic Services  
B.S., University of Texas, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1978. Academic Adviser.
- SPARLING, SHIRLEY R. (1963) ..... Biological Sciences  
B.S., Iowa State College, 1950; M.S., 1951; Ph.D., University of California, 1956; additional graduate study, University of Michigan, Stanford University. Professor.
- SPODEN, PATRICIA S. (1975) .....Student Academic Services  
B.A., St. Cloud University, 1969; M.A., University of Iowa, 1971. Educational Enhancement Coordinator.
- STAFFORD, MARGUERITE A. (1979) ..... Placement Center  
B.A., Spring Arbor College, 1967; M.A., California Polytechnic State University, 1981. Job Developer.

- STAHL, VERLAN H. (1968) ..... Foreign Languages  
B.A., College of the Pacific, 1950; M.A., Florida State University, 1955; Ph.D., University of Madrid, 1969. Professor.
- STALLARD, MARY L. (1965) ..... Physical Education and Recreation Administration  
B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University of Utah, 1974. Professor.
- STANBERRY, LINDA C. (1983) ..... Computer Science and Statistics  
B.A., California State University, Northridge, 1976; M.S., 1981. Associate Professor.
- STANHOPE, TERRY (1981) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, 1968; M.S., University of Southern California, 1976. Associate Professor.
- STANSFIELD, WILLIAM D. (1963) ..... Biological Sciences  
B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, Davis, 1962; Ph.D., 1963. Professor.
- STANTON, GEORGE C. (1981) ..... Counseling Services  
B.A., Lake Forest College, 1963; M.A., Cornell University, 1968; Ph.D., Stanford University, 1980. Associate Test Officer.
- STARKEY, EUGENE E. (1978) ..... Dairy Science  
B.S., California State Polytechnic College, 1952; M.S., University of Wisconsin, 1954; Ph.D., 1958. Professor and Department Head.
- STEARNS, JOSEPHINE S. (1969) ..... Child Development and Home Economics  
B.A., University of New Hampshire, 1958; M.A., Michigan State University, 1969; Ph.D., Texas Woman's University, 1982. Professor.
- STEBBINS, MICHAEL W. (1982) ..... Management  
B.S., University of California, Berkeley, 1967; M.B.A., 1968; Ph.D., 1973. Associate Professor.
- STECHEMAN, JOHN V. (1960) ..... Animal and Veterinary Science  
B.S., University of California, Davis, 1957; M.S., 1960. Professor.
- STEINBERG, HOWARD (1970) ..... Mathematics  
B.M.E., City College of New York, 1950; M.S., New York University Graduate School, 1966; Ph.D., 1969. Professor.
- STEWART, PATRICIA A. (1971) ..... Learning Assistance Center  
B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, 1972. Coordinator.
- STILL, RICHARD R. (1983) ..... Business Administration  
B.A., University of Idaho, 1942; M.B.A., Stanford University, 1950; Ph.D., University of Washington, 1953. Professor.
- STOFFEL, EDWARD O. (1957) ..... Aeronautical and Mechanical Engineering  
B.M.E., University of Santa Clara, 1950; Mech.Engr., 1955; M.S., Oregon State University, 1968. Professor. Registered Professional Engineer, California.
- STOWE, KEITH S. (1971) ..... Physics  
B.S., Illinois Institute of Technology, 1965; M.S., University of California, San Diego, 1967; Ph.D., 1971. Professor and Interim Department Head.
- STRASSER, J. EDWARD (1960) ..... Industrial Technology  
B.S., California State Polytechnic College, 1958; M.B.A., Golden Gate College, 1967. Professor. Licensed Engineering Contractor.
- STRICKMEIER, H. BERNARD (1970) ..... Mathematics  
B.S., Texas Lutheran College, 1962; M.A., University of Texas, 1967; Ph.D., 1970. Professor.
- STROHMAN, ROLLIN D. (1969) ..... Agricultural Engineering  
B.S., University of Illinois, 1962; M.S., 1965; Ph.D., Purdue University, 1969. Professor.
- STRONG, CHARLES W. (1971) ..... English  
B.S., Arizona State University, 1965; M.A., University of Missouri, 1969. Associate Professor.

- STUBBS, DANIEL F. (1963-66) (1968) ..... Computer Science and Statistics  
B.S., Purdue University, 1960; M.S., Rensselaer Polytechnic Institute, 1962; Ph.D., 1973.  
Professor.
- STULTZ, W. FRED (1977) ..... Child Development and Home Economics  
B.A., University of Southern Colorado, 1970; M.S., Purdue University, 1973; Ph.D., 1974.  
Associate Professor.
- SUCHAND, GEORGE J. (1971) ..... Social Sciences  
B.A., Louisiana State University, 1958; M.A., University of Florida, 1967; Ph.D., University  
of Oklahoma, 1972; M.S., California Polytechnic State University, 1978. Professor.
- SUESS, MICHAEL, H. (1975) ..... Personnel and Employee Relations  
B.S., California Polytechnic State University, 1970; M.S., 1971; additional graduate study,  
Brigham Young University. Faculty Personnel Analyst.
- SUHR, MOON JA MINN (1969-71) (1972) ..... Physical Education and  
Recreation Administration  
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., Colorado State College, 1969.  
Professor.
- SULLIVAN, GERALD J. (1968) ..... English  
B.A., University of Wichita, 1957; M.A., University of Oklahoma, 1959; Ph.D., 1964.  
Professor.
- SUTLIFF, DALE A. (1973) ..... Landscape Architecture  
B.S., California State Polytechnic College, Pomona, 1965; M.R.P., University of Pennsylv-  
ania, 1973. Professor.
- SWANK, GREGORY R. (1983) ..... Engineering Technology  
B.S., Ohio State University, 1975. Assistant Professor. Registered Professional Engineer,  
Ohio.
- SWANSEN, VERN (1971) ..... Architecture  
B.Arch., University of Southern California, 1939; M.Arch., University of Strathclyde, 1975.  
Professor.
- SWANSON, BESSIE R. (1977) ..... Music  
A.B., B.Mus., University of the Pacific, 1943; M.A., 1952; D.M.A., Stanford University, 1967.  
Professor and Department Head.
- SWANSON, CLIFTON E. (1967) ..... Music  
B.A., Pomona College, 1963; M.M., University of Texas, 1965; additional graduate study,  
University of California. Professor.
- SWEARINGEN, DON E. (1974) ..... Architecture  
B.Arch., Oklahoma State University, 1968; M.Arch., University of Illinois, 1972. Associate  
Professor.
- SWIDERSKI, MICHAEL (1983) ..... Physical Education and Recreation Administration  
B.S., University of Southern California, 1972; M.A., 1974; Ph.D., University of Oregon, 1981.  
Assistant Professor.
- SYDNOR, WILLIAM E. (1981) ..... Learning Assistance Center  
B.A., Whittier College, 1971; M.A., University of California, Riverside, 1974. Counselor.
- TALBOTT, LAURENCE F. (1966) ..... Industrial Technology  
A.B., San Diego State University, 1951; M.B.A., University of Southern California, 1965;  
Ed.D., Utah State University, 1972; M.Engr., California Polytechnic State University, 1979.  
Professor and Department Head. Registered Professional Engineer, California; Certified  
Plant Engineer.
- TANDON, SHYAMA (1983) ..... Electronic and Electrical Engineering  
B.S., Banaras University, India, 1965; M.S., University of Iowa, 1971; Ph.D., Texas A & M,  
1976. Associate Professor.
- TARTAGLIA, RICHARD A. (1959) ..... Facilities Planning and Operations  
B.S., California State Polytechnic College, 1957. Associate Director of Plant Operations.
- TASKEY, RONALD D. (1977) ..... Soil Science  
B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University, 1978. Associ-  
ate Professor.



- TAYLOR, QUINTARD, JR. (1977) ..... History  
B.A., Saint Augustine's College, 1969; M.A., University of Minnesota, 1971; Ph.D., 1977.  
Associate Professor.
- TELLEW, FUAD H. (1960) ..... Economics  
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University of Southern California, 1954; Ph.D., 1959; post-doctoral research, University of California, Berkeley, 1967-1968. Professor.
- TERRY, RAYMOND D. (1974) ..... Mathematics  
B.S., State University of New York, 1966; M.S., Michigan State University, 1968; Ph.D., 1972.  
Professor.
- THOMAS, GUY H., JR. (1968) ..... Graphic Communications  
B.S., California State Polytechnic College, 1953; M.A., 1971. Professor.
- THOMAS, JOHN W. (1968) ..... Biological Sciences  
B.A., Los Angeles State College, 1957; Ph.D., University of Southern California, Los Angeles, 1968. Professor.
- THOMPSON, ROBERT C. (1981) ..... Agricultural Management  
B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1970.  
Assistant Professor.
- THULIN, ANDREW J. (1979) ..... Animal and Veterinary Science  
B.S., California Polytechnic State University, 1977; M.S., Kansas State University, 1979.  
Assistant Professor.
- THURMOND, WILLIAM (1951) ..... Biological Sciences  
A.B., University of California, 1948; M.A., 1950; Ph.D., 1957. Professor.
- TICE, RUSSELL L. (1965) ..... Chemistry  
B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles, 1965.  
Professor.
- TIMONE, BARNEY R. (1969) ..... Alumni Relations  
B.A., Chico State College, 1965; M.A. Idaho State University, 1969. Interim Director.
- TOWNSEND, NEAL R. (1965) ..... Mathematics  
B.S., Wisconsin State College, 1953; M.A., San Diego State College, 1961; Ph.D., Purdue University, 1972. Professor.
- TROY, BERNARD A. (1970) ..... Education  
B.A., University of Notre Dame, 1957; S.T.L., Universidad Catolica de Chile, 1961; M.A., University of Notre Dame, 1965; Ph.D., University of Southern California, 1974; Fulbright Fellow, Ministry of Education, Montevideo, Uruguay. Professor.
- TRUEX, JOSEPH W. (1954) ..... Graphic Communications  
B.S., California State Polytechnic College, 1952; M.S., South Dakota State University, 1966.  
Professor.
- TRYON, BETTE W. (1976) ..... Child Development and Home Economics  
B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University, 1976. Associate Professor.
- TRYON, WALTER M. (1976) ..... Landscape Architecture  
B.S., Syracuse University, 1964; M.L.A., 1974. Associate Professor.
- TSENG, JAMES H. W. (1969) ..... Electronic and Electrical Engineering  
LL.B., National Taiwan University, 1950; LL.M., Southern Methodist University, 1957; B.S., Illinois Institute of Technology, 1964; M.S., 1966; Ph.D., Southern Methodist University, 1978. Associate Professor. Registered Professional Engineer, Texas.
- VANCE, ROBERT D. (1972) ..... Food Science  
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971.  
Professor and Department Head.
- VAN De VANTER, GORDON L. (1960-66) (1968) ..... Crop Science  
B.S., California State Polytechnic College, 1953; M.A., 1965; additional graduate study, University of California, Davis. Professor.

- VAN EPS, JOHN (1974) ..... Mathematics  
B.A., University of California, Berkeley, 1965; Ph.D., 1969. Associate Professor.
- VAN WYNGAARDEN, WILLEM L. (1965) ..... Physics  
B.S., McMaster University, 1961; M.S., University of Manitoba, 1964; Ph.D., Louisiana State University and A & M College, 1975. Professor.
- VIERRA, RODGER (1978) ..... Agricultural Engineering  
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., 1978. Assistant Professor.
- VIGIL, SAMUEL A. (1982) ..... Civil and Environmental Engineering  
B.S., University of California, Berkeley, 1969; M.S., Texas A & M University, 1974; Ph.D., University of California, Davis, 1981. Associate Professor. Registered Professional Engineer, California.
- VILKITIS, JAMES R. (1980) ..... Natural Resources Management  
B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973-74. Associate Professor.
- VIX, MARLIN DALE (1977) ..... Agricultural Management  
B.S., San Jose State University, 1968; M.S., California Polytechnic State University, 1977. Assistant Professor.
- VOLLMER, HOWARD M. (1982) ..... Extended Education  
B.A., Stanford University, 1951; M.A., 1951; Ph.D., University of California, Berkeley, 1959.
- VOSS, LARRY R. (1968) ..... Office of the President  
B.A., Sacramento State College, 1956; graduate study, Sacramento State College, California State College at Los Angeles. Executive Assistant to the President.
- WADDELL, JOSEPH JAMES (1976) ..... University Library  
B.A., California State College at San Bernardino, 1972; M.L.S. University of California, Los Angeles, 1975. Senior Assistant Librarian.
- WADLINGTON, FAYE (1973) ..... Student Health Services  
R.N., Wichita St. Joseph School of Nursing, Kansas, 1947; additional study, Los Angeles City College, University of California, Los Angeles. Nurse Practitioner.
- WAHL, WILLIAM B. (1966-71) (1973) ..... English  
A.B., San Francisco State University, 1953; M.A., 1954; Ph.D., University of Salzburg, Austria, 1973. Associate Professor.
- WALCH, DAVID B. (1980) ..... University Library  
B.A., Eastern Oregon College, 1958; M.L.S., University of Illinois, 1962; Ph.D., University of Utah, 1973. Director.
- WALKER, HOWARD D. (1957) ..... Chemistry  
B.A., New York University, 1947; M.S., 1948; Ph.D., University of California, Los Angeles, 1955. Professor.
- WALKER, KENDRICK W. (1973) ..... Philosophy  
B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Associate Professor and Department Head.
- WALKER, ROBERT E. (1983) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1968; M.S., Utah State University, 1978. Associate Professor. Registered Professional Engineer, Colorado.
- WALL, LEONARD W. (1969) ..... Physics  
B.S., Louisiana Polytechnic Institute, 1963; Ph.D., Iowa State University, 1969. Professor.
- WALL, MATTHIAS R. (1976) ..... Construction Management  
B.S., University of Wisconsin, 1962; M.B.A., 1972; Ph.D., Texas A & M, 1976. Professor.
- WALLACE, WILLIAM CARL (1970) ..... Student Affairs  
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.A., 1973; additional graduate study, University of California, Santa Barbara. Associate Dean and Director, Judicial Affairs.
- WALLER, JULIA R. (1983) ..... Financial Aid  
B.A., California State University, Sacramento, 1982. Counselor.

- WALSH, JOHN P., JR., MAJ (1981) ..... Military Science  
B.S., United States Military Academy, 1968; J.D., Western New England College School of Law, 1979.
- WALTER, VIRGINIA R. (1974) ..... Ornamental Horticulture  
B.S., Ohio State University, 1970; M.S., 1972. Associate Professor.
- WALTERS, DIRK R. (1969) ..... Biological Sciences  
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Professor.
- WALTERS, KENNETH D. (1983) ..... School of Business  
B.A., Walla Walla College, 1963; J.D., Stanford Law School, 1966; Ph.D., University of California, Berkeley, 1972. Professor and Dean.
- WALTERS, ROBERT W. (1970) ..... Activities Planning Center  
B.A., California State College, Fullerton, 1962; M.A., California Polytechnic State University, 1971. Assistant Director.
- WAMBACH, ROBERT F. (1981) ..... Natural Resources Management  
B.S., University of Montana, 1957; M.S., University of Michigan, 1959; Ph.D., University of Minnesota, 1967. Professor.
- WANG, MARY Y. (1973) ..... Food Science  
B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1972. Professor.
- WARD, EDWARD JOHN (1970) ..... City and Regional Planning  
B.S., University of Massachusetts, 1962; M.U.P., Michigan State University, 1964; Ph.D., Claremont Graduate School, 1983. Professor.
- WARFIELD, DAVID L. (1975) ..... Crop Science  
B.S., University of California, Davis, 1966; M.S., 1968; Ph.D., Washington State University, 1973. Associate Professor.
- WARREN, RICHARD L. (1981) ..... Education  
B.A., Harvard University, 1947; M.A., Peabody College for Teachers, 1950; Ph.D., Stanford University, 1966. Professor and Department Head.
- WARTEN, RALPH M. (1968) ..... Mathematics  
B.S., Brooklyn College, 1957; M.S., Purdue University, 1959; Ph.D., 1961. Professor.
- WASSEL, GUSTAV N. (1980) ..... School of Engineering and Technology  
B.S., California Institute of Technology, 1960; M.S., 1962; Ph.D., University of California, Irvine, 1972. Interim Associate Dean and Coordinator of Engineering Science.
- WATERBURY, ARCHIE M. (1973) ..... Biological Sciences  
A.B., San Jose State College, 1966; M.A., 1968; Ph.D., University of California, Davis, 1972. Associate Professor.
- WEATHERBY, JOSEPH N., JR. (1968) ..... Political Science  
B.A., Baylor University, 1958; B.F.T., American Institute for Foreign Trade, 1961; M.A., Baylor University, 1962; Ph.D., University of Utah, 1968; additional graduate study, Baldwin Wallace College, Ohio; Hamline University, Minnesota; American University, Cairo; Cambridge University. Professor.
- WEBB, JAMES L. (1969) ..... Physical Education and Recreation Administration  
B.S., University of North Dakota, 1962; M.S., 1963; Ph.D., University of Oregon, 1969. Professor.
- WEBER, BARBARA P. (1966) ..... Child Development and Home Economics  
B.S., University of Nevada, 1951; M.A., California Polytechnic State University, 1968; additional graduate study, University of Nevada, California Polytechnic State University, Oregon State University. Associate Professor.
- WEBRE, NEIL W. (1969) ..... Computer Science and Statistics  
B.S., Louisiana State University, 1960; A.M., Harvard University, 1968; additional graduate study, Columbia University, University of Munich. Professor.
- WEBSTER, JAMES P., JR. (1964) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1953; M.S., California Polytechnic State University, 1980. Professor.

- WEINSTEIN, STEPHEN T. (1969) ..... Mathematics  
B.A., University of Southern California, 1960; M.A., 1965; Ph.D., 1972. Professor.
- WENZL, MICHAEL J. (1969) ..... English  
B.A., University of Oregon, 1961; M.A., 1965; Ph.D., University of New Mexico, 1969;  
postdoctoral study, University of California, Berkeley. Professor.
- WESSELS, HENRY (1970) ..... Art  
B.S., Northern Illinois University, 1957; M.F.A., University of Southern California, 1970.  
Associate Professor.
- WEST, HOWARD (1959) ..... Office of the President  
B.A., Pepperdine College, 1956; M.A., California State Polytechnic College, 1971. Associate  
Executive Vice President.
- WEST, JOHN W. (1968) ..... School of Agriculture and Natural Resources, Poultry  
B.S.A., University of Tennessee, 1947; M.S., 1948; Ph.D., Purdue University, 1951. Professor  
and Associate Dean.
- WESTOVER, JAMES D. (1971) ..... Chemistry  
B.S., Arizona State College, 1960; M.S., 1962; Ph.D., Brigham Young University, 1966.  
Professor.
- WHALEY, GLENN V. (1963) ..... University Library  
B.A., Carroll College, 1949; M.L.S., University of Wisconsin, 1953; M.A., Drake University,  
1965. Associate Librarian.
- WHALEY, RUSSELL G. (1982) ..... Speech Communication  
B.A., Emerson College, 1950; graduate study, Yale University. Professor.
- WHALLS, MARVIN J. (1968) ..... Natural Resources Management  
B.S., Michigan State University, 1951; M.S., University of Michigan, 1957; Ph.D., 1970.  
Professor.
- WHEATLEY, JO ANN C. (1980) ..... Crop Science  
B.A., Southeastern Louisiana University, 1961; M.S., California Polytechnic State Univer-  
sity, 1978; additional graduate study, Louisiana State University. Assistant Professor.
- WHEATLEY, PATRICK O. (1970) ..... Computer Science and Statistics  
B.A., St. Mary's Seminary, 1956; M.S., University of Chicago, 1963; Ph.D., University of  
Houston, 1970. Professor.
- WHEELER, ERNEST J., JR. (1969) ..... Intercollegiate Athletics  
B.A., University of Washington, 1961; M.S., University of Southern California, 1966. Coach.
- WHEELER, MARYLINDA (1975) ..... Physical Education and Recreation Administration  
B.A., Stanford University, 1958; M.A., 1959; Ph.D., University of Utah, 1979. Associate  
Professor.
- WHEELER, ROBERT R. (1961) ..... Animal and Veterinary Science  
B.S., Colorado State University, 1952; M.S., 1955; Ph.D., Oregon State University, 1962.  
Professor.
- WIGHT, HEWITT G. (1952) ..... Chemistry  
B.S., University of Utah, 1943; Ph.D., University of California, 1955. Professor.
- WILK, EDWARD A. (1966) ..... University Library  
B.A., Western Michigan University, 1965; M.S.L., 1966. Associate Librarian.
- WILKINS, SMILEY E. (1974) ..... Office of the President  
B.S., Winston Salem State University, 1951; graduate study, University of Southern Califor-  
nia, University of Utah, California Polytechnic State University. Affirmative Action  
Coordinator.
- WILLIAMS, DOUGLAS W. (1983) ..... Agricultural Engineering  
B.S., Kansas State University, 1967; M.S., Iowa State University, 1969; Ph.D., University of  
California, Davis, 1973. Associate Professor. Registered Mechanical Engineer, California.
- WILLIAMS, GRAYDON J. (1970) ..... Music  
B.M., New England Conservatory of Music, 1957; M.M., 1959; additional study, Eastman  
School of Music, Peabody Conservatory of Music. Associate Professor.

- WILLIAMSON, DANIEL P. (1970) ..... Economics  
B.A., University of California, Santa Barbara, 1966; Ph.D., University of California, San Diego, 1973. Professor.
- WILLIAMSON, DAVID G. (1968) ..... Chemistry  
B.A., University of Colorado, 1963; Ph.D., University of California, Los Angeles, 1966; postdoctoral fellow; National Research Council of Canada. Professor.
- WILLIS, BETTY (1980) ..... Student Academic Services  
B.S., Ohio University, 1976. Career and Graduate Counselor.
- WILLS, MAX THOMAS (1967) ..... Chemistry  
B.S., University of Puget Sound, 1961; Ph.D., University of Washington, 1965. Professor.
- WILSON, JACK D. (1976) ..... Aeronautical and Mechanical Engineering  
B.S., Michigan State University, 1956; M.S., 1958; Ph.D., 1968. Professor. Registered Professional Engineer, California and Georgia.
- WILSON, MALCOLM W. (1968) ..... Academic Affairs  
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