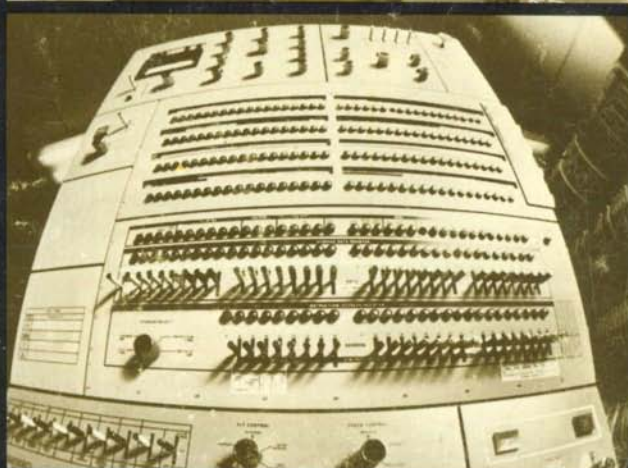
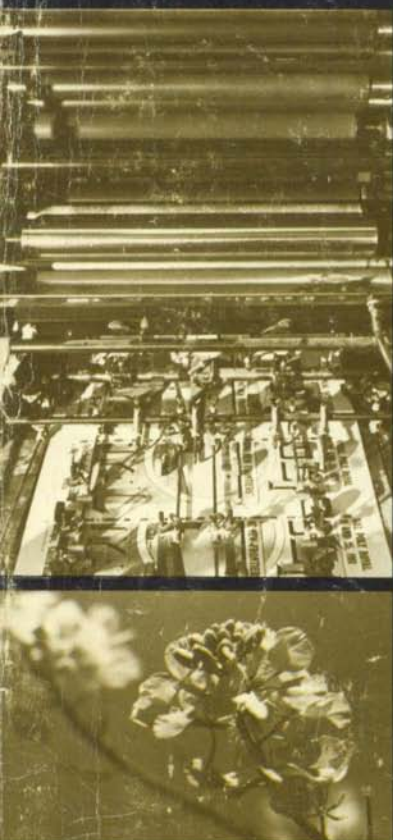


Cal Poly, San Luis Obispo

1981-83 Catalog

THIS CATALOG VALID
THROUGH SUMMER 1984



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California Polytechnic State University

Announcements

(USPS 084-960)

1981-1983

CATALOG ISSUE

TWENTY YEARS OF SERVICE TO CALIFORNIA
1961-1981

CSUC/20

The California State
University and Colleges

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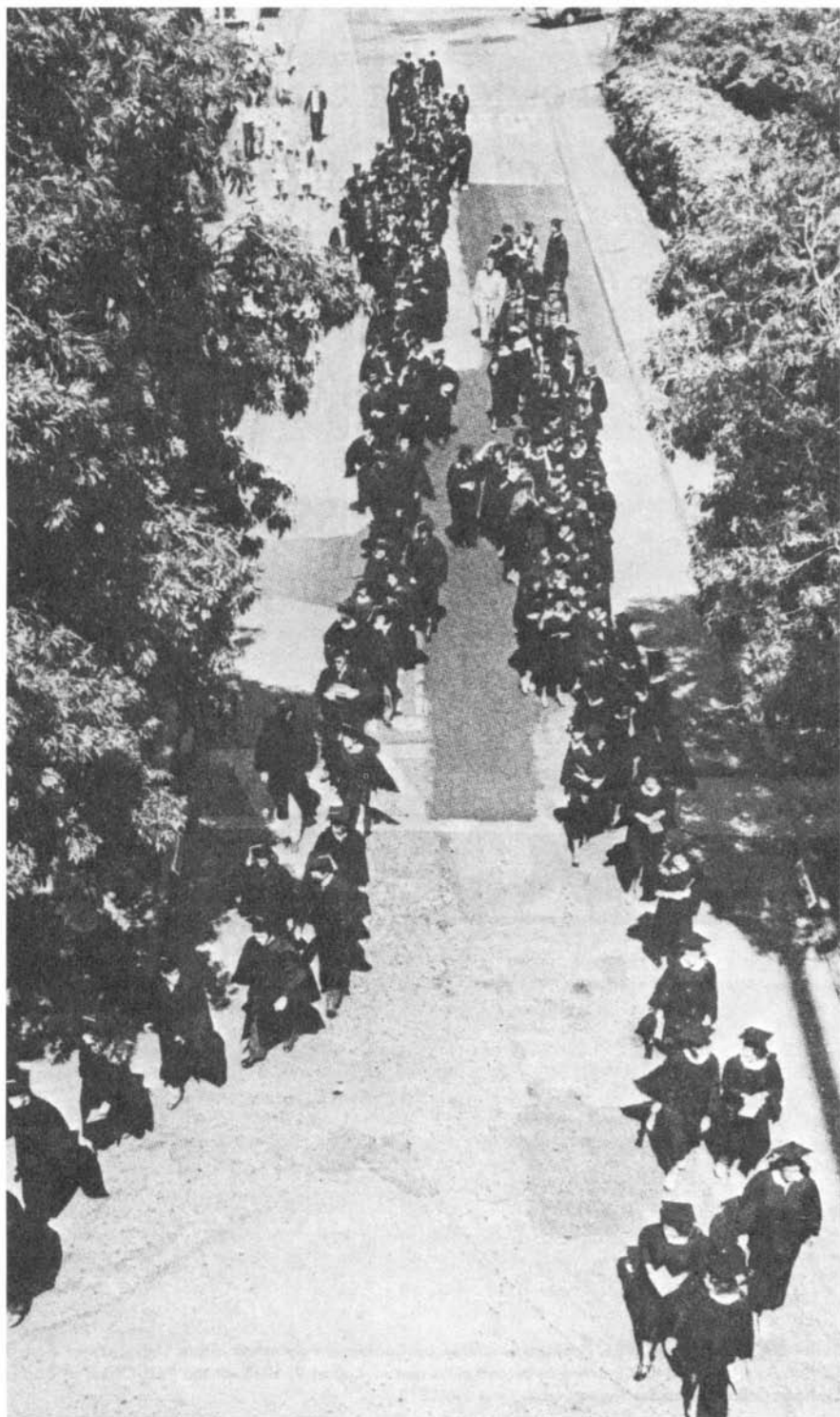


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ACADEMIC CALENDAR—1981–1983

Summer Quarter 1981

June 22	Monday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
June 29	Monday	Last day to enroll for summer quarter Last day to add courses
July 13	Monday	Last day to withdraw from classes without petition
August 10	Monday	End of seventh week
August 28	Friday	Last day of classes
August 31– September 4	Monday–Friday	Final examination period
September 4	Friday	End of summer quarter
September 5–13	Saturday–Sunday	Academic holiday

Fall Quarter 1981

September 14	Monday	Beginning of fall quarter (faculty only)
September 21	Monday	Fall quarter classes begin
September 28	Monday	Last day to enroll for fall quarter Last day to add courses
October 12	Monday	Last day to withdraw from classes without petition
November 9	Monday	End of seventh week
November 11	Wednesday	Academic holiday—Veteran's Day
November 25–29	Wednesday–Sunday	Academic holiday—Thanksgiving
December 4	Friday	Last day of classes
December 7–11	Monday–Friday	Final examination period
December 11	Friday	End of fall quarter
December 12– January 3	Saturday–Sunday	Academic holiday

Winter Quarter 1982

January 4	Monday	Beginning of winter quarter Winter quarter classes begin
January 11	Monday	Last day to enroll for winter quarter Last day to add courses
January 25	Monday	Last day to withdraw from classes without petition
February 15	Monday	Academic holiday—Washington Day
February 23	Tuesday	End of seventh week
March 12	Friday	Last day of classes
March 15–19	Monday–Friday	Final examination period
March 19	Friday	End of winter quarter
March 20–28	Saturday–Sunday	Academic holiday

Spring Quarter 1982

March 29	Monday	Beginning of spring quarter Spring quarter classes begin
April 5	Monday	Last day to enroll for spring quarter Last day to add courses
April 19	Monday	Last day to withdraw from classes without petition
April 23	Friday	Last day to apply for June commencement
May 17	Friday	End of seventh week
May 31	Monday	Academic holiday—Memorial Day
June 4	Friday	Last day of classes
June 7–11	Monday–Friday	Final examination period
June 12	Saturday	Commencement
		End of spring quarter
		End of university year (faculty only)
June 13–20	Sunday–Sunday	Academic holiday

Summer Quarter 1982

June 21	Monday	Beginning of university year Beginning of summer quarter
June 28	Monday	Summer quarter classes begin Last day to enroll for summer quarter Last day to add courses
July 5	Monday	Academic holiday—Independence Day
July 13	Tuesday	Last day to withdraw from classes without petition
August 10	Tuesday	End of seventh week
August 27	Friday	Last day of classes
August 30– September 3	Monday–Friday	Final examination period
September 3	Friday	End of summer quarter
September 4–12	Friday–Sunday	Academic holiday

Fall Quarter 1982

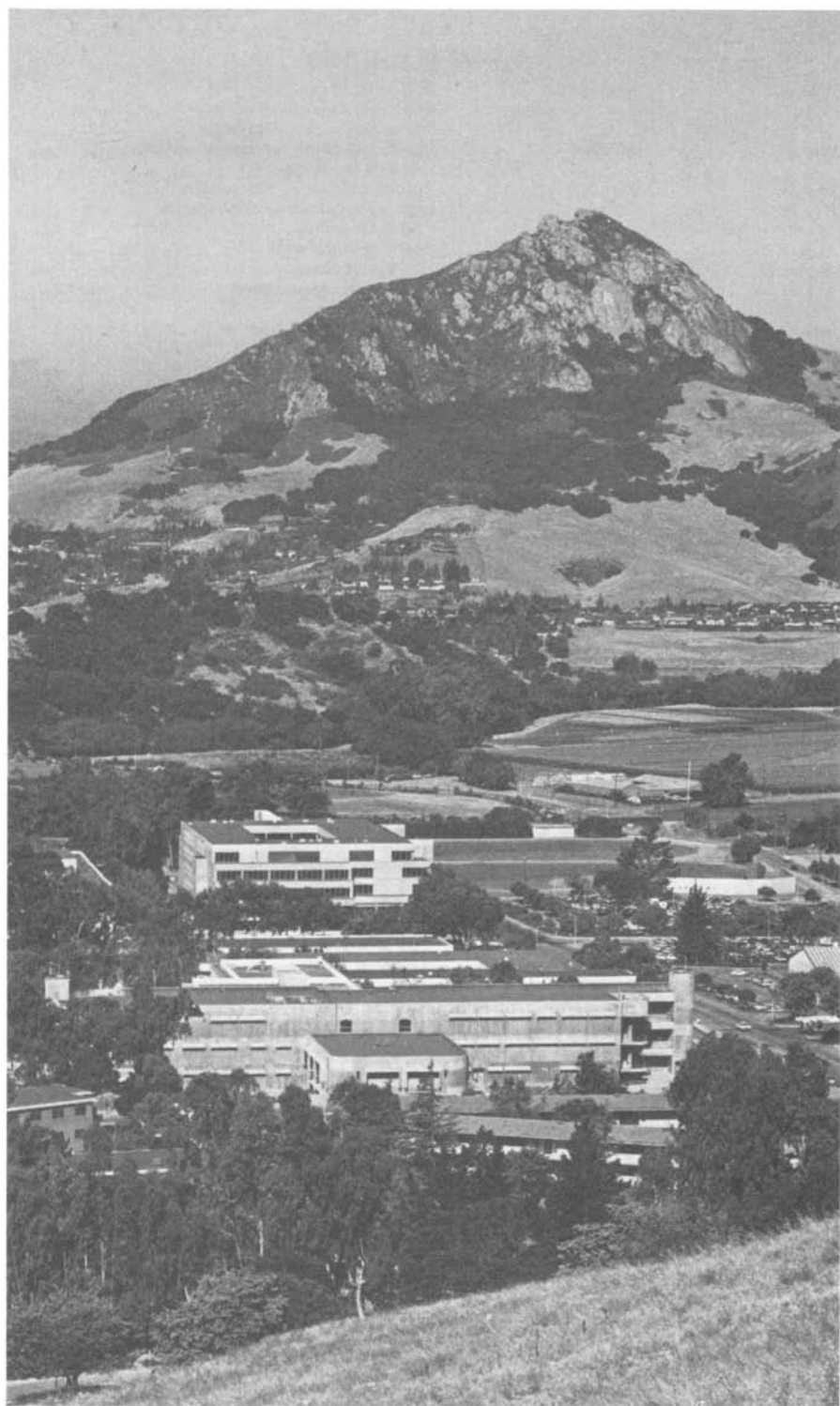
September 13	Monday	Beginning of fall quarter (faculty only)
September 20	Monday	Fall quarter classes being
September 27	Monday	Last day to enroll for fall quarter Last day to add courses
October 11	Monday	Last day to withdraw from classes without petition
November 8	Monday	End of seventh week
November 11	Thursday	Academic holiday—Veteran's Day
November 24–28	Wednesday–Sunday	Academic holiday—Thanksgiving Day
December 3	Friday	Last day of classes
December 6–10	Monday–Friday	Final examination period
December 10	Friday	End of fall quarter
December 11– January 2	Saturday–Sunday	Academic holiday

Winter Quarter 1983

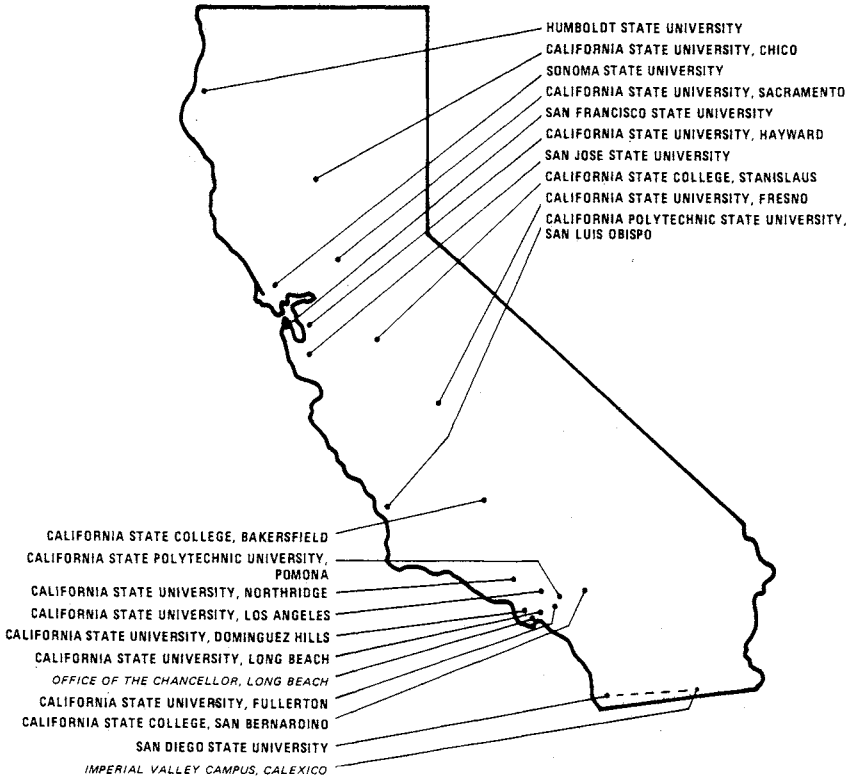
January 3	Monday	Beginning of winter quarter Winter quarter classes begin
January 10	Monday	Last day to enroll for winter quarter Last day to add courses
January 24	Monday	Last day to withdraw from classes without petition
February 21	Monday	Academic holiday—Washington Day
February 22	Tuesday	End of seventh week
March 11	Friday	Last day of classes
March 14–18	Monday–Friday	Final examination period
March 18	Friday	End of winter quarter
March 19–27	Saturday–Sunday	Academic holiday

Spring Quarter 1983

March 28	Monday	Beginning of spring quarter Spring quarter classes begin
April 4	Monday	Last day to enroll for spring quarter Last day to add courses
April 18	Monday	Last day to withdraw from classes without petition
April 22	Friday	Last day to apply for June commencement
May 16	Monday	End of seventh week
May 30	Monday	Academic holiday—Memorial Day
June 3	Friday	Last day of classes
June 6–10	Monday–Friday	Final examination period
June 11	Saturday	Commencement End of spring quarter



THE CALIFORNIA STATE UNIVERSITY AND COLLEGES





THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

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. Today, 16 of the 19 campuses have the title "University."

The oldest campus—San Jose State University—was founded 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 and Colleges 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 and Colleges, 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 and Colleges 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 CSUC offers more than 1,400 bachelor's and master's degree programs in some 200 subject areas. Approximately 350 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 CSUC 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 1980 totaled over 300,000 students, who were taught by a faculty of 17,500. Last year the system awarded over 53 percent of the bachelor's degrees and 33 percent of the master's degrees granted in California. Almost 800,000 persons have been graduated from the 19 campuses since 1960.

TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

EX OFFICIO TRUSTEES

The Honorable Edmund G. Brown Jr.	State Capitol, Sacramento 95814
Governor of California	
The Honorable Mike Curb.....	State Capitol, Sacramento 95814
Lieutenant Governor of California	
The Honorable Willie L. Brown, Jr.	State Capitol, Sacramento 95814
Speaker of the Assembly	
The Honorable Wilson C. Riles	721 Capitol Mall, Sacramento 95814
State Superintendent of Public Instruction	
Dr. Glenn S. Dumke	400 Golden Shore, Long Beach 90802
Chancellor of The California State University and Colleges	

APPOINTED TRUSTEES

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

Mr. Charles Luckman (1982)	9220 Sunset Blvd., Los Angeles 90069
Mr. Frank P. Adams (1981)	235 Montgomery St., Suite 1045, San Francisco 94104
Mr. Dean S. Leshner (1981)	P.O. Box 5166, Walnut Creek 94598
Dr. Claudia H. Hampton (1982)	450 N. Grand, Room G353, Los Angeles 90012
Dr. Mary Jean Pew (1983)	5515 Franklin Ave., Los Angeles 90028
Mr. Willie J. Stennis (1983)	3947 Landmark, Culver City 90230
Dr. Juan Gómez-Quiñones (1984)	Professor, History Department University of California, Los Angeles 405 Hilgard Ave., Los Angeles 90024
Mr. John F. O'Connell (1982)	P.O. Box 3965, San Francisco 94119
Ms. Blanche C. Bersch (1984)	291 S. La Cienega Blvd., Suite 410, Beverly Hills 90211
Mr. Michael R. Peevey (1985)	215 Market St., Suite 930, San Francisco 94105
Mr. John F. Crowley (1985)	3068 16th St., San Francisco 94103
Ms. Wallace Albertson (1986)	1618 Sunset Plaza Dr., Los Angeles 90069
Mr. Eli Broad (1986)	10801 National Blvd., Los Angeles 90064
Mr. Donald G. Livingston (1987)	550 S. Flower St., Los Angeles 90071
Ms. Celia I. Ballesteros (1987)	110 West C St., Suite 2202, San Diego 92101
Mr. Jason E. Peltier (1981)	510 Bercut Dr., Suite H, Sacramento 95814
Mrs. Lynne Myers (1988) *	514 Doheny Rd., Beverly Hills 90210
Dr. August Coppola (1988) *	1040 North Las Palmas, Los Angeles 90038

* Appointment is subject to confirmation by the State Senate.

OFFICERS OF THE TRUSTEES

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President

Dr. Claudia H. Hampton
Chairperson

Mr. John F. O'Connell
Vice Chairperson

Chancellor Glenn S. Dumke
Secretary-Treasurer

OFFICE OF THE CHANCELLOR
The California State University and Colleges
400 Golden Shore
Long Beach, California 90802
(213) 590-5506

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 Dr. Alex C. Sherriffs Vice Chancellor, Academic Affairs
 Dr. Robert Tyndall Acting Vice Chancellor, Faculty and Staff Affairs
 Mr. Mayer Chapman General Counsel

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

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 9001 Stockdale Highway, Bakersfield, California 93309 (805) 833-2011
 California State University, Chico Dr. Robin S. Wilson, President
 1st & Normal Streets, Chico, California 95929 (916) 895-5011
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 Carson, California 90747 (213) 516-3300
 California State University, Fresno Dr. Harold H. Haak, President
 Shaw and Cedar Avenues, Fresno, California 93740 (209) 487-9011
 California State University, Fullerton Dr. Miles D. McCarthy, Acting President
 Fullerton, California 92634 (714) 773-2011
 California State University, Hayward Dr. Ellis E. McCune, President
 Hayward, California 94542 (415) 881-3000
 Humboldt State University Dr. Alistair W. McCrone, President
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 California State University, Long Beach Dr. Stephen Horn, President
 1250 Bellflower Boulevard, Long Beach, California 90840 (213) 498-4111
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 5151 State University Drive, Los Angeles, California 90032 (213) 224-0111
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 18111 Nordhoff Street, Northridge, California 91330 (213) 885-1200
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 California State University, Sacramento Dr. W. Lloyd Johns, President
 6000 J Street, Sacramento, California 95819 (916) 454-6011
 California State College, San Bernardino Dr. John M. Pfau, President
 5500 State College Parkway, San Bernardino, California 92407 (714) 887-7201
 San Diego State University Dr. Thomas B. Day, President
 5300 Campanile Drive, San Diego, California 92182 (714) 265-5000
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 720 Heber Avenue, Calexico, California 92231 (714) 357-3721
 San Francisco State University Dr. Paul F. Romberg, President
 1600 Holloway Avenue, San Francisco, California 94132 (415) 469-2141
 San Jose State University Dr. Gail Fullerton, President
 Washington Square, San Jose, California 95192 (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. Peter Diamandopoulos, President
 1801 East Cotati Avenue, Rohnert Park, California 94928 (707) 664-2880
 California State College, Stanislaus Dr. A. Walter Olson, President
 800 Monte Vista Avenue, Turlock, California 95380 (209) 633-2122

Average Annual Costs and Sources of Funds Per Full-Time Equivalent Student

The 19 campuses and the Chancellor's Office of The California State University and Colleges are financed primarily through funding provided by the taxpayers of California. Including capital outlay, the CSUC 1980/81 budget totals approximately \$1.1 billion. Approximately \$1.074 billion of the \$1.1 billion total has been budgeted to provide support for a projected 230,750 full-time equivalent (FTE*) students. Thus, excluding costs which relate to capital outlay and the Energy and Resources Fund (e.g., building amortization), the average cost per FTE student is \$4,652 per year. Of this amount, the average student pays \$387. Included in this average student payment calculation is the amount paid by nonresident students. The remaining \$4,265 in costs is funded by state and federal taxes.

Averages do not fit all students alike or even any specific student. To arrive at an average figure that is meaningful, the costs outlined above exclude "user fees" for living expenses, housing, and parking as well as costs for extension and summer session work. Computations are based on full-time equivalent students, not individuals, and costs are prorated by system totals, not by campus. The average costs for a full-time equivalent student in the system are depicted in the following chart:

Total 1980-81 CSUC Budget (Projected Enrollment: 230,750 FTE)

Funding Source	Amount	Average Cost Per Student (FTE) *	Percentage
State Appropriation (Support)	\$929,137,926	\$4,026	86.6%
Student Charges.....	89,303,075	387 **	8.3%
Federal (Financial Aids)	55,094,386	239	5.1%
State Funding (Capital Outlay and Energy and Resources Fund)	25,553,233	***	***
Total	<u>\$1,099,088,620</u>	<u>\$4,652</u>	<u>100.0%</u>

- * For budgetary purposes, full-time equivalent (FTE) translates total head count into total academic student load. The term assumes that a full-time student in The California State University and Colleges is enrolled for 15 units of academic credit. Some students enroll for more than 15 units; some students enroll for fewer than 15 units.
- ** The average costs paid by a student include the student services fee, health facilities fee, college union fee, student body fee, and the non-resident tuition. This amount is derived by taking the total of all student fees and dividing by the total full-time equivalent student enrollment. Individual students may pay more or less than \$387 depending on whether they are part-time, full-time, resident or nonresident students.
- *** Not included in the Average Cost Per Student (FTE), and Percentage columns. The estimated replacement cost of all the system's permanent facilities and equipment on the 19 campuses is currently valued at \$3.12 billion, excluding the cost of land.

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EDUCATION AT CAL POLY

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

The California State Legislature has authorized special goals for California Polytechnic State University, San Luis Obispo. The administration and faculty are dedicated to achieving these goals, and students are attracted to Cal Poly because they want to benefit from the special educational opportunities offered. These opportunities have led to significant, meaningful jobs for thousands of graduates.

Historically, Cal Poly's dedication to educational programs with an emphasis on occupations and careers has 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. Cal Poly's special character is reflected in its majors: of the 56 offered, nine are available within The California State University and College system only at Cal Poly, and another 12 are offered at only one other CSUC campus. These special emphases are reflected in such applied fields as agriculture, architecture, business, engineering, home economics, and science and mathematics, disciplines which draw special support from core University-level programs offered in the fields of communicative arts, education, humanities, and the social sciences.

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. A concurrent sequence of general education and elective courses assists the student in relating the chosen area of study to other fields of knowledge. Faculty members, who are selected on the basis of academic qualifications, professional experience, and teaching ability, are encouraged to give the highest priority to effective teaching. 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, and internships. Such practical educational experiences in the major field prepare the student for specific occupations and professions or for advanced study.

In addition to preparing the student to meet the requirements of specific occupations, 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 characterize Cal Poly's mode of learning.

HISTORICAL DEVELOPMENT

California Polytechnic State University began when in 1901 the State Legislature established a vocational high school at San Luis Obispo. The institution served as a forerunner in vocational education for agriculture and industry in California. In 1921 its Board of Trustees was dissolved and the State Board of Education administered the school until July 1, 1961, when administration passed to the Trustees of The California State University and Colleges.

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.

Throughout its history, 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

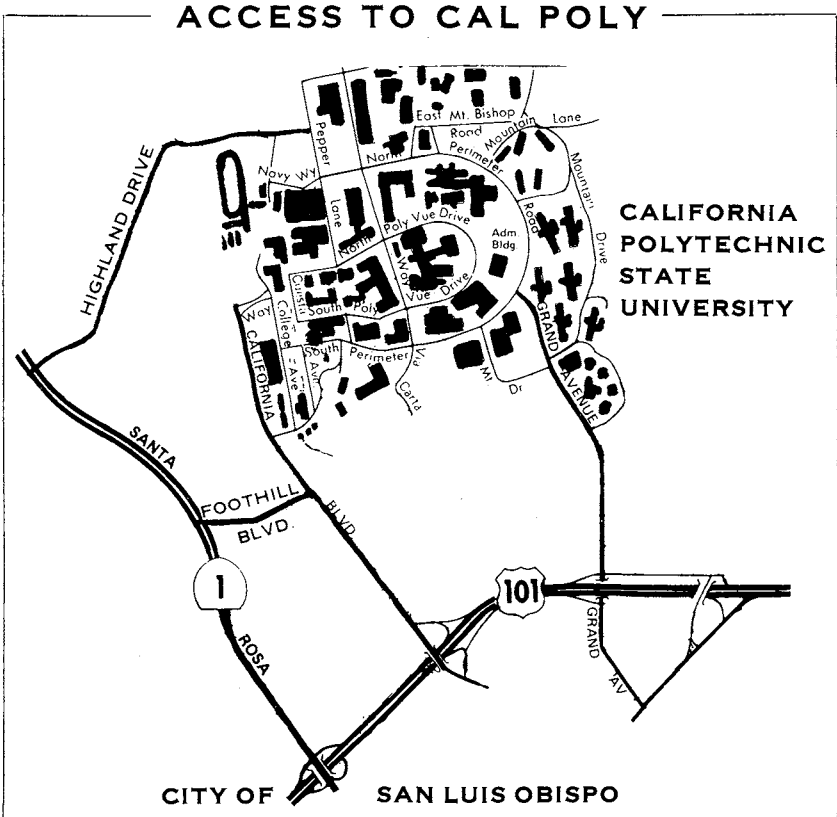
Under their leadership, Cal Poly has developed into one of the nation's outstanding career-oriented universities.

THE CAMPUS

The Cal Poly campus consists of over 5,000 acres adjacent to San Luis Obispo, a community of 35,000 located 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.

Due to the varied 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. Additionally, the campus has a number of support facilities that complement the educational environment, including an on-campus residence hall complex for over 2,800 students, a variety of dining facilities for both resident and nonresident users, extensive physical education facilities, an on-campus health center, and a university union complex.

Cal Poly has long been known as a friendly campus which welcomes visitors. Maps suitable for a self-conducted tour are available from the information desk of the Administration Building for interested prospective students and parents and others. Arrangements for group visits to the campus may be made by contacting the Relations with Schools Office or the office of the dean of the respective academic school.



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 by the National Architectural Accrediting Board; Construction 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, Air Conditioning and Refrigeration Technology, Civil Engineering, Electrical Engineering, Electronic Engineering, Electronic Technology, Environmental Engineering, Industrial Engineering, Manufacturing Processes Technology, Mechanical Engineering, Mechanical Technology, Metallurgical Engineering, and Welding Technology are accredited by the Accrediting Board for Engineering and Technology; and Industrial Technology by the National Association of Industrial Technology.

Other accredited programs are the Agricultural Engineering program accredited by the Accrediting Board for Engineering and Technology, the Chemistry program by the American Chemical Society, and the Home Economics program by the American Home Economics Association. The Dietetics program is recognized by the American Dietetics Association.

In addition the California Commission for Teacher Preparation and Licensing 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 considers faculty participation in professional development activities including research consistent with the primary function of the University to be essential for quality instruction. Outside sources of funding to promote professional development activities and research are actively sought by the University through the Development Office, the Research Development Office, and through support of proposals initiated by individual faculty members. Opportunities for student participation in research and development occur in classroom and laboratory exercises, senior projects, master's theses, and through working as student assistants on sponsored projects.

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:

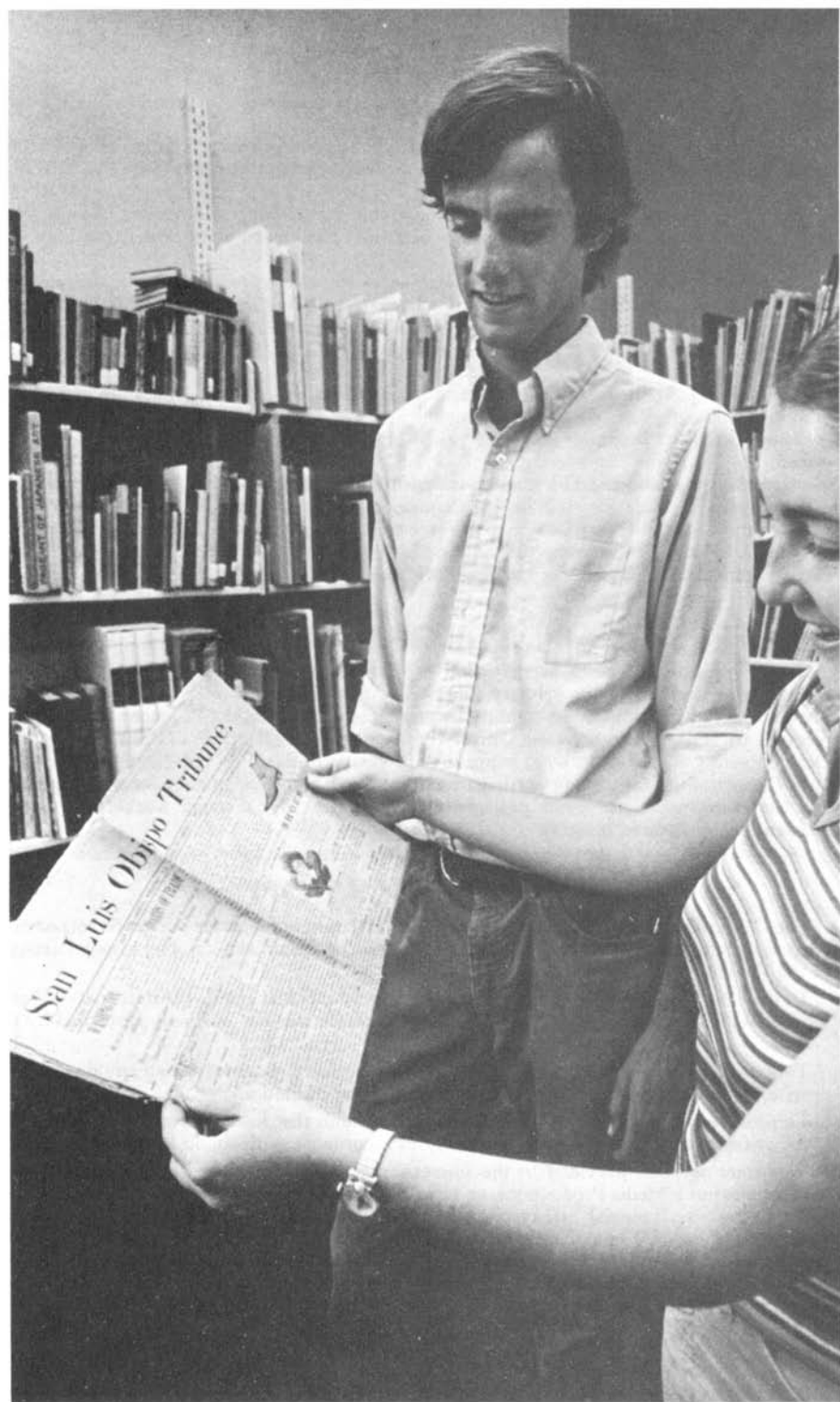
- To provide the fiscal means and management procedures that enable the university to carry on activities providing those instructional and service aids not normally furnished by the state.

- To provide effective operation and to eliminate undue difficulties which could otherwise arise, due to budgetary, purchasing, and other fiscal limitations.

- 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*. Prospective applicants who are not sure of these requirements are encouraged to 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 and Colleges or at any California high school or community college.

UNDERGRADUATE APPLICATION PROCEDURES

Prospective undergraduates, applying for part-time or full-time programs of study, must file a complete application as described in the application booklet. The \$25 nonrefundable application fee should be in the form of a check or money order payable to The California State University and Colleges and may not be transferred or used to apply to another term. Undergraduate applicants need file only at their first choice campus. An alternate choice campus and major may be indicated on the application, but *applicants should list as alternate campus only that campus of The California State University and Colleges that they can attend*. (At most campuses, an alternate degree major will be considered at the first choice campus before an application is redirected to an alternate choice campus.) Applicants will be considered automatically at the alternate 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. Nonresidents, foreign or domestic, usually are not considered for admission to impacted programs. High school and community college counselors are advised 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. Effective with the fall 1980 filing period campuses are authorized to use a freshman applicant's ranking on the eligibility index, the transfer applicant's overall GPA, 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 *Counselors Digest* 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 at 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 graduate the preceding term are also required to complete and submit an application and the \$25 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 a separate application (including fees) to each. Applications may be obtained from the Graduate Studies Office of any California State University or College campus in addition to the sources noted for undergraduate applicants. No one is formally admitted to a postbaccalaureate degree program without having been matriculated through the process described above.

APPLICATION FILING PERIODS

Term	Applications First Accepted	Filing Period Duration	Student Notification Begins
Summer	Previous Feb. 1	Each campus accepts applications until capacities are reached.	Previous March
Fall	Previous Nov. 1		Previous Dec.
Winter	Previous June 1	Campuses will close individual programs as they reach capacity.	Previous July
Spring	Previous Aug. 1		Previous Sept.

SPACE RESERVATION NOTICES

Most applicants will receive some form of space reservation notice from their 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 the applicant's 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 eligibility is governed by an eligibility index. The index is computed using the high school grade point average on all course work completed in the last three years of high school, not counting physical education and military science; and the ACT composite, or the SAT total score. A table of grade point averages, with corresponding test scores equation by which the index is computed, is reproduced below.

Registration forms and test dates for either test may be obtained from school or college counselors, from the address below, or from the campus testing offices. For either test, submit the registration form and fee at least one month prior to the test date.

	ACT Address	SAT Address
	American College Testing Program, Inc. Registration Unit, P.O. Box 414 Iowa City, Iowa 52240	The College Board Box 592 Princeton, New Jersey 08541

EXCERPTS FROM ADMISSIONS ELIGIBILITY 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.

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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).

Undergraduate Transfer Applicants (Resident and Nonresident)

Transfer admission eligibility is based on TRANSFERABLE college units attempted, rather than on all college units attempted. California Community College transfers should consult their counselors for information on transferability of courses. Applicants in good standing at the last institution attended may be admitted as undergraduate transfers if they meet either of the following requirements:

1. Eligible for admission in freshman standing (see freshman requirements) with a grade point average of "C" (2.0 on a scale where A = 4.0) or better in all transferable college units attempted.
2. Completed at least 56 transferable semester units or 84 transferable quarter units with a grade point average of "C" (2.0 on a scale where A = 4.0) or better if a California resident; nonresidents must have a grade point average of 2.4 or better.

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 \$25 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.

PLANNED EDUCATIONAL LEAVE

Under certain approved circumstances, the Planned Educational Leave Program makes it possible for students to leave school temporarily without being subject to regular readmissions procedures.

1. Planned Educational Leave must be for purposes which will contribute to the student's educational objectives.
2. Planned Educational Leave will not be approved when the student plans to enroll at another educational institution or obtain work experience.

A student who has an approved Planned Educational Leave will be considered to be in continuous attendance as a regular student and will not be required to apply for readmission or pay an application fee.

Applications for Planned Educational Leaves and regulations governing such leaves may be obtained from the Admissions Office.

HIGH SCHOOL STUDENTS

Students still enrolled in high school will be considered for enrollment in certain special programs if recommended by the principal 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 and Colleges. Interested prospective students may request copies of the published information from the Director of Placement.

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 or College 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 or College 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 or College under unclassified postbaccalaureate standing above, but who has deficiencies in prerequisite preparation which in the opinion of the appropriate campus authority can be met 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 or College 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 to such curricula.

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ENGLISH PLACEMENT TEST AND GRADUATION WRITING REQUIREMENTS

All students subject to degree requirements of 1977-78 and subsequent general catalogs must demonstrate competency in writing skills as a requirement for graduation. In addition, all lower division students (those who enter with fewer than 56 transferable semester units) are required to take the CSUC English Placement Test (EPT) so that information can be available to help in the selection of appropriate course work in writing skills and to prepare for meeting the graduation requirement. 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 CSUC Executive Order 186, may lead to disqualification from further attendance. *The results of the EPT will not affect admissions eligibility.*

Information bulletins and registration materials for the EPT will be mailed to all students subject to these requirements. Alternatively, the materials may be obtained from the Office of Admissions and Records. Information on currently available ways to meet the EPT or the graduation requirement may be obtained from the Writing Skills Program Office.

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 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.

CREDIT FOR MILITARY SERVICE

Nine quarter units of elective credit will be allowed toward graduation to any student with 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.

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 questions on the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student may not enroll in classes until complete responses to those items are on file in the Admissions Office.

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 and Colleges is found in *Education Code* Sections 68000-68090, 90403, 89705-89707.5, 68124, and 68121, and in Title 5 of the *California Administrative Code*, Article 4 (commencing with Section 41900) of Subchapter 5 of Chapter 1, Part V. 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 residence determination date to show an intent to make California the permanent home with concurrent relinquishment of the prior legal residence. An intention to establish and maintain California residence can be shown by 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 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, etc.

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 minor's parents, or, in the case of permanent separation of the parents, 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 man or a woman may establish his or her residence; marriage is not a governing factor.

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 1981-82 academic year are:

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Fall September 20
Winter January 5
Spring April 1
Summer July 1

There are several 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 below the age of 19 who have been present in California 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. A student who is an adult alien is entitled to residence classification if the student has been lawfully admitted to the United States for permanent residence in accordance with all applicable provisions of the laws of the United States; provided, however, that the student has had residence in California for more than one year after such admission prior to the residence determination date. A student who is a minor alien shall be entitled to residence classification if both the student and the parent from whom residence is derived have been lawfully admitted to the United States for permanent residence in accordance with all applicable laws of the United States, provided that the parent has had residence in California for more than one year after acquiring such permanent residence prior to the residence determination date of the term for which the student proposes to attend the University.
- 7. Certain credentialed, full-time employees of school districts.
- 8. Full-time State University and Colleges 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 a year.
- 9. Certain exchange students.
- 10. 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.
- 11. A person in continuous full-time attendance at an institution who had resident classification on May 1, 1973, shall not lose such classification as a result of adoption of the uniform student residency law on which this statement is based, until the attainment of the degree for which currently enrolled.

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

The California State University and Colleges
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 coursework 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

A Student Services Fee was established by the Board of Trustees of The California State University and Colleges in January 1975.

The student services fee provides financing for the following student services programs not covered by State funding:

- 1) Social and Cultural Development Activities: provides for the coordination of various student activities, student organizations, student government, and cultural programs.
- 2) Counseling: includes the cost of counselor's salaries and clerical support plus operating expenses and equipment.
- 3) Testing: covers the cost of test officers, psychometrists, clerical support, operating expenses, and equipment.
- 4) Placement: provides career information to students and faculty for academic program planning and employment information to graduates and students.
- 5) Financial Aid Administration: includes the cost of the counseling and business services provided in connection with the financial aid programs.
- 6) Health Services: provides health services to students and covers the cost of salaries of medical officers and nurses plus related clerical and technical personnel as well as operating expenses and equipment.
- 7) Housing: includes the cost of personnel providing student housing information and monitoring housing services.
- 8) Student Services Administration: covers 50 percent of the cost of the Dean of Students Office which has responsibility for the overall administration of student services.

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

Application fee (nonrefundable).....	\$25.00
Campus services card fee (each student, per card).....	5.00
Facilities fee (non-State funded, per quarter)	2.00
Student services fee (per quarter):	
0-6.0 units.....	53.00
more than 6 units	63.00

Additional State Fees (subject to change):

Transcript of record.....	2.00
Late registration fee	20.00
Credit by examination fee (per unit)	1.00
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)	1,131.00
Summer quarter (does not include deposit or installment charge)	377.00
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.....	29.00
Activity	38.00
Laboratory	58.00
Summer session fee (per quarter unit)	32.00
Nonresident tuition:	
For 15 units or more (per quarter)	945.00
For less than 15 units (per quarter per unit or fraction of unit)	63.00
Cooperative Education (per quarter unit)	39.00
Auxiliary organization fees (subject to change)	
Associated Students fee (required):	
Summer.....	6.00
Fall	12.00
Winter and spring quarters, each	7.00
University Union fee (required):	
Summer.....	10.00
Academic year each quarter	14.00
Meals (subject to change):	
19 meals per week, academic year.....	1,236.00
14 meals per week, academic year.....	1,119.00
Health fee (for optional services):	
Academic year	54.00
Quarterly.....	23.00

ALL FEES LISTED ARE SUBJECT TO CHANGE, WITHOUT NOTICE. MANY WILL PROBABLY BE RAISED FOR THE 1981-82 AND 1982-82 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 the Class Schedule for the applicable quarter, or 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 such a service as furnishing copies of a student's transcript. 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

In the event a student desires to pay any fees by use of BankAmericard, VISA, or Master Charge, he/she should contact the Business Office. If the student's bank does not have a check service program through the campus, the student may seek a cash advance at a local bank.

PROCEDURE FOR THE ESTABLISHMENT OF A STUDENT BODY FEE

The law governing The California State University and Colleges 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 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 upon recommendation by the campus. 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</i>	<i>Degrees</i>
School of Agriculture and Natural Resources		
	Agriculture	M.S.
	General Agricultural Sciences	
	International Agriculture	
	Mechanized Agriculture	
	Soil Conservation	
Agricultural Education Department	Agricultural Science	B.S.
	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.
	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.
	Husbandry	
	Manufacturing	
Food Science Department	Food Science	B.S.
Natural Resources Management Department	Natural Resources Management	B.S.
	Environmental Services	
	Fishery and Wildlife Management	
	Forest Resources Management	
	Parks and Outdoor Recreation	
Ornamental Horticulture Department	Ornamental Horticulture	B.S.
	Floriculture and Nursery Production	
	Horticulture Sales and Services	
	Landscape Industry	
Poultry Department	Poultry Industry	B.S.
Soil Science Department	Soil Science	B.S.
School of Architecture and Environmental Design		
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.

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<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations</i>	<i>Degrees</i>
Construction Department	Construction	B.S.
Landscape Architecture Department	Landscape Architecture	B.S.
School of Business		
Accounting Department	Business Administration	M.B.A.
	Business Administration Accounting	B.S.
Business Administration Department	Business Administration Finance and Property Management Marketing Management	B.S.
Economics Department	Economics Business and Industrial Economics International Trade and Development Quantitative Economics	B.S.
Management Department	Business Administration Human Resources Management International Business Management Management Management Information Systems	B.S.
School of Communicative Arts and Humanities		
Art Department	Applied Art and Design Graphic Design Photography	B.S.
English Department	English	B.A., M.A.
Foreign Languages Department		
Graphic Communications Department	Graphic Communications Computer Graphic Communications Design Reproduction Packaging Printing Management	B.S.
History Department	History	B.A.
Journalism Department	Journalism Agricultural Journalism Broadcast Journalism News-Editorial Photojournalism Public Relations	B.S.
Music Department		
Philosophy Department		
Political Science Department	Political Science International Affairs Pre-Law Public Administration Teaching Urban Studies	B.A.

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations</i>	<i>Degrees</i>
Social Sciences Department	Social Sciences Community Studies Criminal Justice Cross-Cultural Studies Social Sciences (Teaching) Social Services	B.S.
Speech Communication Department	Speech Communication	B.A.
School of Engineering and Technology		
	Engineering	M.Engr.
	Engineering Science	B.S.
Aeronautical and Mechanical Engineering Department	Aeronautical Engineering Mechanical Engineering General Nuclear Petroleum	B.S. B.S. B.S.
Civil Engineering Department	Civil Engineering	B.S.
Electronic and Electrical Engineering Department	Electrical Engineering Electronic Engineering	B.S. B.S.
Engineering Technology Department	Engineering Technology Air Conditioning-Refrigeration Technology Electronic Technology Manufacturing Processes Technology Mechanical Technology Welding Technology	B.S.
Environmental Engineering Department	Environmental Engineering Air and Water Pollution Control Air conditioning-Refrigeration and Solar Energy Systems	B.S.
Industrial Engineering Department	Industrial Engineering Production Management Systems Analysis	B.S.
Industrial Technology Department	Industrial Arts Automotives Drafting Electronics Graphic Arts Metals Wood-Plastics	B.A., M.A.
Metallurgical and Welding Engineering Department	Industrial Technology Metallurgical Engineering	B.S. B.S.

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<i>Schools and Departments</i>	<i>Curricula with Options/Concentration</i>	<i>Degrees</i>
School of Human Development and Education		
	Liberal Studies	B.A.
Child Development and Home Economics Department	Child Development	B.S.
	Child Development Family Studies	
Education Department	Dietetics-Food Administration	B.S.
	Home Economics	B.S., M.S.
	Education	M.A.
	Administrative Services Counseling and Guidance Curriculum and Instruction Reading	
	Special Education Special Interest Option	
Physical Education Department	Physical Education	B.S., M.S.
	Athletic Coaching Health Education Teaching	
	Recreation Administration	B.A.
	Therapeutic Recreation	
Psychology Department		
School of Science and Mathematics		
Biological Sciences Department	Biological Sciences	B.S., M.S.
	Anatomy-Physiology	
	Biology	
	Botany	
	Marine Biology	
	Plant Pathology-Entomology	
	Environmental and Systematic Biology	B.S.
	Microbiology	B.S.
Chemistry Department	General Microbiology Medical Laboratory Technology	
	Biochemistry	B.S.
Computer Science and Statistics Department	Chemistry	B.S., M.S.
	Computer Science	B.S., M.S.
Mathematics Department	Statistics	B.S.
	Mathematics	B.S.
	Applied Mathematics Finite Mathematics Mathematics Teaching	
	Mathematics	M.S.
	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 1980**

Schools and Major Curricula	Under- grad- uate Pro- grams	Grad- uate Pro- grams	Men	Women	Total Enroll- ment
<i>School of Agriculture and Natural Resources</i>					
Agriculture (M.S.)	-	100	74	26	100
Agricultural Education/Science	109	-	41	68	109
Agricultural Engineering	118	-	108	10	118
Agricultural Management	863	-	602	261	863
Animal Science	599	-	225	374	599
Crop Science	197	-	156	41	197
Dairy Science	121	-	77	44	121
Food Science	122	-	53	69	122
Fruit Science	55	-	41	14	55
Mechanized Agriculture	101	-	99	2	101
Natural Resources Management	377	-	227	150	377
Ornamental Horticulture	686	-	376	310	686
Poultry Industry	36	-	32	4	36
Soil Science	111	-	70	41	111
Totals	3,495	100	2,181	1,414	3,595
<i>School of Architecture and Environmental Design</i>					
Architectural Engineering	185	-	152	33	185
Architecture	868	24	726	166	892
City and Regional Planning	115	18	103	30	133
Construction	130	-	125	5	130
Landscape Architecture	192	-	130	62	192
Totals	1,490	42	1,236	296	1,532
<i>School of Business</i>					
Business Administration	1,334	39	685	688	1,373
Economics	130	-	87	43	130
Totals	1,464	39	772	731	1,503
<i>School of Communicative Arts and Humanities</i>					
Applied Art and Design	181	-	55	126	181
English	173	24	37	160	197
Graphic Communications	352	-	192	160	352
History	115	-	63	52	115
Journalism	275	-	86	189	275
Political Science	247	-	133	114	247
Social Sciences	362	-	108	254	362
Speech	88	-	21	67	88
Totals	1,793	24	695	1,122	1,817

ENROLLMENT IN UNDERGRADUATE AND GRADUATE PROGRAMS, AND
ENROLLMENT OF MEN AND WOMEN STUDENTS, BY SCHOOL AND
MAJOR, FALL 1980 (Continued)

Schools and Major Curricula	Under- grad- uate Pro- grams	Grad- uate Pro- grams	Men	Women	Total Enroll- ment
<i>School of Engineering and Technology</i>					
Aeronautical Engineering	249	-	227	22	249
Civil Engineering	324	-	258	66	324
Electrical Engineering	160	-	144	16	160
Electronic Engineering	672	-	625	47	672
Engineering (M Engr.)	-	12	11	1	12
Engineering Science	38	-	33	5	38
Engineering Technology	486	-	469	17	486
Environmental Engineering	199	-	150	49	199
Industrial Arts	99	17	110	6	116
Industrial Engineering	186	-	137	49	186
Industrial Technology	183	-	154	29	183
Mechanical Engineering	709	-	667	42	709
Metallurgical Engineering	77	-	73	4	77
Totals	3,382	29	3,058	353	3,411
<i>School of Human Development and Education</i>					
Child Development	426	-	18	408	426
Dietetics and Food Administration	278	-	5	273	278
Education	-	396	118	278	396
Home Economics	451	10	4	457	461
Liberal Studies	295	-	30	265	295
Physical Education	419	25	177	267	444
Recreation Administration	169	-	61	108	169
Vocational Education	1	-	-	1	1
Totals	2,039	431	413	2,057	2,470
<i>School of Science and Mathematics</i>					
Biochemistry	148	-	84	64	148
Biological Sciences	460	35	255	240	495
Chemistry	86	15	72	29	101
Computer Science	392	50	290	152	442
Environmental and Systematic Biology	95	-	42	53	95
Mathematics	229	9	137	101	238
Microbiology	112	-	33	79	112
Physical Science	15	-	12	3	15
Physics	57	-	51	6	57
Statistics	17	-	11	6	17
Totals	1,611	109	987	733	1,720
Campus Totals	15,274	774	9,342	6,706	16,048

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."

APPLICATION FOR GRADUATION

A student should request a graduation evaluation from the Evaluations Office at least three quarters prior to the student's anticipated graduation date. The Evaluations Office will notify the student when the application for graduation has been prepared. The student must file the Application for Graduation in the Records Office at least one quarter prior to the student's anticipated graduation date. The actual date of graduation will be the end of the quarter when all requirements have been met.

Diploma Regulations

Upon filing the application 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 as specified on the application, or if the student completes final degree requirements within the quarter following the expected date of graduation without enrolling in a required course. 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 have been met at the time the application for graduation is filed.

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, as a BA and a BS, 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 36 units of course work 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.

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,

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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. (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 according to the approved curriculum for each major. Candidates in engineering must present at least 200 units (210 units in Architectural Engineering). 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.

The Board of Trustees has approved a resolution requiring a demonstration of writing skills competency as a requirement for graduation. Students will be advised when further information is available on methods for meeting this requirement.

The Board of Trustees of the California State University and Colleges has adopted a CSUC Graduation Writing Requirement in which all students must demonstrate proficiency in writing skills at the upper-division level as a requirement for graduation. At California Polytechnic State University, San Luis Obispo, there are three options for meeting the requirement:

1. Arrange through the Writing Skills Program office to complete the Junior Writing Test.
2. Pass with a grade of "C" or higher one of the approved 300-level composition courses.
3. Pass with a grade of "C" or higher an approved 300-level literature course AND receive certification for proficiency in writing from the instructor.

GENERAL EDUCATION—BREADTH

All candidates for the bachelor's degree must complete a minimum of 72 quarter units of general education—breadth as specified below. Twelve of the units counted for general education—breadth must be upper division (300–400 level), and at least twelve units must be earned at California Polytechnic State University, San Luis Obispo. The curriculum for each major published in this catalog is designed to satisfy general education—breadth requirements. The requirements are met in different ways depending on the particular major. The student planning to transfer from another college should therefore consult the published curriculum for the major and plan course work accordingly.

General Education—Breadth Objectives

General education—breadth requirements in The California State University and Colleges are so designed that, taken with the major depth program and elective credits presented by each 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 now functions, about the physical world in which they live, about the other forms of life with which they share that world, and about the cultural endeavors and legacies of their civilizations;
- (c) will have come to an understanding and appreciation of the principles, methodologies, value systems, and thought processes employed in human inquiries.

General Education—Breadth Requirements

- (a) A minimum of 12 units in communication in English to include oral communication and written communication and in critical thinking to include consideration of common fallacies in reasoning.

(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.

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

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

(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.

MASTER'S DEGREES

Cal Poly offers graduate programs leading to the master's degree in several 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 Announcement*.

TEACHER PREPARATION PROGRAMS

California Polytechnic State University is authorized by the California Commission for Teacher Preparation and Licensing 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) Specialist

Further information, requirements, and procedures for entering a particular credential program may be obtained from 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 Arts, 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

Cal Poly's Cooperative Education program incorporates productive, major-related work into a student's academic studies. Cooperative Education students are given the opportunity to combine classroom theory with "on-the-job training," to work with professionals in their particular field of study, and to test their career choice. In addition to augmenting their

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marketable knowledge, students earn academic credit, receive competitive wages, and develop maturity. The program is available to all Cal Poly students upon the completion of their freshman year.

Cooperative Education offers a closely supervised program of alternating periods of on-campus study integrated with off-campus, full-time employment in areas directly related to a student's major and career goals.

Work assignments are made through the combined efforts of the student's academic department and the Cooperative Education office. Work assignments are negotiated with employers throughout California and the Western United States and include assignments with city, state, and federal governmental agencies, agriculture, business, and all facets of private industry.

Students receive an on-the-job evaluation and are required to attend a seminar, write a term paper, and do a task analysis. Additional information regarding academic policies, areas of employment, or evaluations may be obtained through the Cooperative Education office or the departmental coordinators for Cooperative Education programs.

INSERVICE TRAINING IN AGRICULTURE

Cal Poly plays an active role in the inservice training of teachers of vocational 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.

The annual summer conference of the California Agricultural Teachers Association is held at the campus with an attendance of over 300 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 128, 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 128, 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 Vice President for Academic Affairs, Administration 307, 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 103, 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; 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 Records Office or the Extended Education Office.

The travel study program offers students, faculty, and community residents college credit while traveling anywhere in the world. Independent travel projects may also be arranged with the Travel Study Coordinator, 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 Announcement* regarding requirements for applicability of credit toward their degree objectives.

INTERNATIONAL PROGRAMS

The California State University and Colleges (CSUC) offers opportunities for students to pursue their studies at a distinguished foreign university or special program center. Under the auspices of the CSUC Office of International Programs, participants in this program are concurrently enrolled at their home campus, where they earn full academic credit for their overseas studies.

Cooperating universities abroad include the University of Sao Paulo, Brazil; the University of Copenhagen, Denmark (through Denmark's International Studies Program); the Université de 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 Universidad Ibero-Americana, Mexico; Massey University and Lincoln University College, New Zealand; the Universidad Católica, Peru; the Universities of Quebec (Canada); National Chengchi University, the Republic of China (Taiwan); the Universities of Madrid and Granada, Spain; and the University of Uppsala, Sweden.

Eligibility for application is limited to those students who will have upper division or graduate standing by September, 1982 at a CSUC campus, 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. (Brazil, France, Germany, Mexico, Peru, Quebec francophone universities, and Spain currently require language study.) 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. Applicants to the programs in Israel, Japan, New Zealand, and Quebec must also be accepted by the respective cooperating universities.

The International Programs supports all tuition and other academic and administrative costs overseas for each of its participants to the same extent that such funds would be expended to support similar costs in California. Students assume costs for pre-departure orientation, insurance, transportation, housing, and meals. Home campus registration and other fees and personal incidental expenses or vacation travel costs while abroad are also paid by the student. Nonresident students are subject to nonresident fees. The Office of International Programs collects and administers funds for those items which the program must arrange or can negotiate more effectively, such as home campus fees, orientation costs, insurance, outbound transportation, and, in some centers, housing. International Programs participants may apply for any financial aid available at their home campuses, except for campus work-study.

Applications for the 1982-83 academic year must be submitted by February 9, 1982, except for the program in New Zealand for which applications must be submitted by May 15, 1982 for participation during calendar year 1983. The academic year in New Zealand begins in February and ends in October.

Detailed information and application materials may be obtained from the International Programs Office, Dexter Building 211; further information may also be obtained by writing to The California State University and Colleges International Programs, 400 Golden Shore, Suite 300, Long Beach, California 90802.

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. This is the last day for students to withdraw from a class without penalty, file a petition for Credit-No Credit grading in a course, or change from Credit status to Audit status in a course.

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 and Colleges. 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 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 Announcement*.

- 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. The student will be advised of probation status promptly.
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 the dean of the school in which the student is enrolled as soon as possible 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), the Association of Intercollegiate Athletics for Women (AIAW), 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, AIAW, 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 unforeseen, but fully justified, reasons and that there is still a possibility of earning credit. It is the responsibility of the student 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.

An "I" must be made up within one calendar year immediately following the end of the term on which it was assigned. This limitation prevails whether or not the student maintains continuous enrollment. 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

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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 one of 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 Director of Admissions, Records and Evaluations.

WITHDRAWALS FROM COURSES

The "W" symbol indicates that the student was permitted to drop the course after the 15th day of instruction 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 course without academic penalty during the initial 15 instructional days of the quarter provided the instructor is formally notified. Between the 15th instructional day and the end of the 7th week 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, 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.

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. These periods are defined as the last day to add courses or the sixth academic day, and the last day to withdraw from classes without petition, the fifteenth academic day, or third week census date. Specific dates for completing these transactions are published in the annual academic calendar and in each 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.

The student has approximately one week in which to add a course, complete the late-registration process, increase units in a course, and to change from audit to credit. Each change requires that the student initiate contact with the instructor and present a valid Campus Services Card which verifies enrollment for the quarter in progress. Exceptions are made for late registrants and for selected extension students who are required to have all enrollment transactions completed at the end of the first week and all fees paid by the third week census date.

The student has until the third week to withdraw from a course without penalty or entry on the academic record, and to change from credit to audit status in a course. In either instance, it is the student's responsibility to notify the instructor. 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. The student must not assume that voluntary absence from class means automatic withdrawal. At the third week census date, 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 third week see under **WITHDRAWALS**.

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.

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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 DEVIATION

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 deviation 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 300, 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 Education 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 1) access to student records maintained by the campus, and 2) the release of such records. In brief, the law provides that the campus must provide students access to official 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 is: 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 public 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, the most recent previous educational agency or institution attended by the student, and any other information authorized in writing 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 must be filed with the Director, Judicial Affairs, on a form provided by the Director, within three working days following the end of the Computer Assisted Registration (CAR) filing period.

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 are eligible for "Graduation with Honors" if they have earned a 3.2 or better cumulative grade point average, including all college level work attempted at Cal Poly and all college level work accepted from other institutions.

Similarly, those with a corresponding grade point average of 3.6 or better are eligible for "Graduation with Highest Honors."

Graduation with Honors 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 5 *Cal Adm Code* 41301 and 41302, which deal specifically with student disciplinary regulations, are distributed to all new students during each registration period 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 and Colleges 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 he or she is alleged to be in 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, 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 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.

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(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. **Expulsion, Suspension or Probation of Students; Fees and Notification.** 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. In the event that a student who has not reached his or her eighteenth birthday and who is a dependent of his or her parent(s) as defined in Section 152 of the Internal Revenue Code of 1954 is suspended or expelled, the President shall notify his or her parent or guardian of the action by registered mail to the last known address, return receipt requested.

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 boards established to oversee Week of Welcome, Men's and Women's Boards of Athletic Control, Music Board of Control, ASI Program Board, Cultural Awareness Committee, and Poly Royal Board, etc. All interested students have an opportunity to participate in student government.

ATHLETICS

Intercollegiate competition is held under the rules and auspices of the National Collegiate Athletic Association and the Association of Intercollegiate Athletics for Women. Conference competition is maintained in most sports as a member of the California Collegiate Athletic Association and Southern California Athletic Association. Intercollegiate competition is offered for men in the sports of football, basketball, wrestling, baseball, track, swimming, water polo, cross country, soccer, tennis and volleyball. Women's sports are conducted in volleyball, track, basketball, cross country, gymnastics, tennis, softball, and swimming. Junior varsity competition is offered in sports where competition is available and sufficient interest warrants it. For eligibility rules see Eligibility for Intercollegiate 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. 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 SERVICES

Cal Poly provides a number of services designed to help students in their college work. Some of the services are directed toward group activities and experiences, others toward helping students overcome individual problems.

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 Development, Testing, and Consultation Services are located in the Administration building. The Learning Assistance Center is located in the Library.

DISABLED STUDENT SERVICES

The Disabled Student Services (DSS) Office provides information and supportive services to permanent and temporarily disabled students to assist them in achieving educational and life goals. Promotion of campus accessibility and awareness of the problems and needs of disabled students, as well as elimination of attitudinal barriers, are goals of the program. DSS also coordinates activities of the campus disabled students' organization, funded by the Associated Students, Inc. For additional information, contact the Disabled Students Services Office.

EDUCATIONAL OPPORTUNITY PROGRAMS

The Educational Opportunity Program has been designed under State guidelines to recruit, assist in admission procedures, and provide support services for a limited number of students who have experienced economic and educational disadvantages. EOP offers a wide variety of support services, including learning and study skill courses, tutoring, curriculum planning, career guidance and counseling to the EOP students after they are admitted to Cal Poly. A limited number of state EOP financial aid grants are available to EOP students each year, in addition to a wide variety of financial awards from state and federal sources through the university Financial Aid Office.

CSUC entrance requirements may be waived for a limited number of high school graduates and community college transfers. Agencies authorized to nominate students to the program include high schools, community colleges, the Veteran's Administration and certain other state agencies. For further information, contact the Educational Opportunity Program Office.

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, and vending areas. In

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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 59 for meal plan requirement for resident students.

FRATERNITIES AND SORORITIES

Eight national fraternities, eight national sororities, and four local fraternities have chapters at Cal Poly. The fraternities are: Alpha Epsilon Pi, Alpha Gamma Rho, Alpha Phi Alpha, Alpha Sigma, Alpha Tau Omicron, Alpha Upsilon, Delta Sigma Phi, Delta Tau, Lambda Chi Alpha, Phi Kappa Psi and Theta Chi. The sororities are: Alpha Chi Omega, Alpha Kappa Alpha, Alpha Phi, Delta Sigma Theta, 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 ten members each. Students interested in seeking affiliation with a sorority or fraternity should contact either the Panhellenic Office (for sororities) in the Dean of Students Office or the Interfraternity Council (for fraternities) 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 injuries and illnesses. 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, augmented health fee (Health Card) 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 augmented services are not available during summer quarter.

3. 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

On-Campus Housing

On-campus residence hall facilities are available for 2,793 men and women. The residence hall environment is one in which "the individual counts as a person."

A stimulating intellectual and social living environment is an important part of the student's education. Study is encouraged in all the halls. All residence halls are either "quiet" or "semi-quiet" halls. Professional housing personnel work with residents in planning student programs which compliment the regular university educational programs. Programs such as intramural activities, discussion groups on current national issues and well-planned social events with fellow residents overcome feelings of isolation and loneliness, thus creating a residence hall environment conducive to strong personal growth and development.

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
2. Returning students designated as hardship cases by the Dean of Students Office 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 vacancies, all other students under 30 years of age, unless 30 and above are granted special permission by the Dean of Students.

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 per quarter, annual license required (double occupancy)	1,131.00
Board, annual (mandatory) (academic year)	1,119.00
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 \$1,236.00 prepaid for the academic year. The 14-meal plan provides for a maximum of 14 meals per week at a cost of \$1,119.00 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.

Off-Campus Housing

The Off-campus 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 three student-centered objectives: to help clarify employment objectives and establish goals; to explore the full range of employment possibilities; and to present the student or graduate effectively as a candidate.

Career Placement Services

Every prospective graduate of the University should register with the Placement Center no later than the first quarter of the senior year. Candidates for a teaching credential should register with the Placement Center 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. How to identify and research employers, clarifying the job objective, preparation of the Educational Placement File and resumé, and interview training are only a few of the topics covered. Employer contacts are developed on an individual basis as well as through an extensive on-campus interview program.

Student Employment—Job Development/Work Experience

On-campus and off-campus part-time employment opportunities are available to students through the Placement Center. These opportunities are available on a first-come, first-served basis throughout the year. In addition to the walk-in service, a special effort is made to place students in career-related part-time or summer employment through the Job Development/Work Experience Program. Available to students are job listings from throughout California and the Western United States along with a limited number of on-campus interviews.

STUDENT EMPLOYMENT

Both on-campus and off-campus part-time employment opportunities are available to students on a year-round basis. The University is highly committed to providing working opportunities for students as evidenced by the number of campus jobs available. Services are provided on a first-come, first-served basis. Students are encouraged to take summer employment in fields related to their major. The Placement Center receives many summer job listings from ranches and businesses throughout the western United States. Available to students are job listings and a limited number of on-campus interviews.

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 the Financial Aid Office, California high schools or colleges. Scholarship applications may be requested directly from the Financial Aid Office.

The deadline for filing the Student Aid Application for California (SAAC) is March 1. Scholarship applications are also due March 1. Scholarship applicants must also complete the SAAC which should be submitted to the College Scholarship Service, Box 70, Berkeley, California, 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 additional tuition fees. Of the total amount, the student should be prepared to pay from \$130 to \$180, depending upon his major, at the time of fall quarter registration and approximately the same amount at the time of registration for other quarters.* 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 and Colleges.)

Associated Student fee	\$10.00
University Union fee	14.00
Health fee—optional (per quarter)	18.00
Student services fee (per quarter)	52.00
Facilities fee	2.00
Instructionally-Related Activities Fee	4.00
Room and board with mandatory annual 19-meal ticket.....	744.00
Books and supplies (estimated)	90.00†
Personal expenses and transportation	300.00
Estimated total per quarter (approximately 3 months).....	\$1,116.00

SCHOLARSHIPS AND AWARDS

General Information

Scholarships awarded by the University are available to both entering and enrolled students who meet the scholastic and financial need requirements of the University scholarship funds. These scholarships are made available from various sources, usually corporations, individuals, or interested groups outside the campus. Approximately 350 scholarships are awarded yearly.

How to Apply

To be considered for a scholarship, a student or prospective student must complete a scholarship application. Students may secure an application from the Financial Aid Office. A Student Aid Application for California is required.

Selection Criteria

Applicants are judged upon their need, scholastic ability, character and participation in school and community affairs. In addition, certain scholarships require special conditions concerning field of study, residence, and other similar factors.

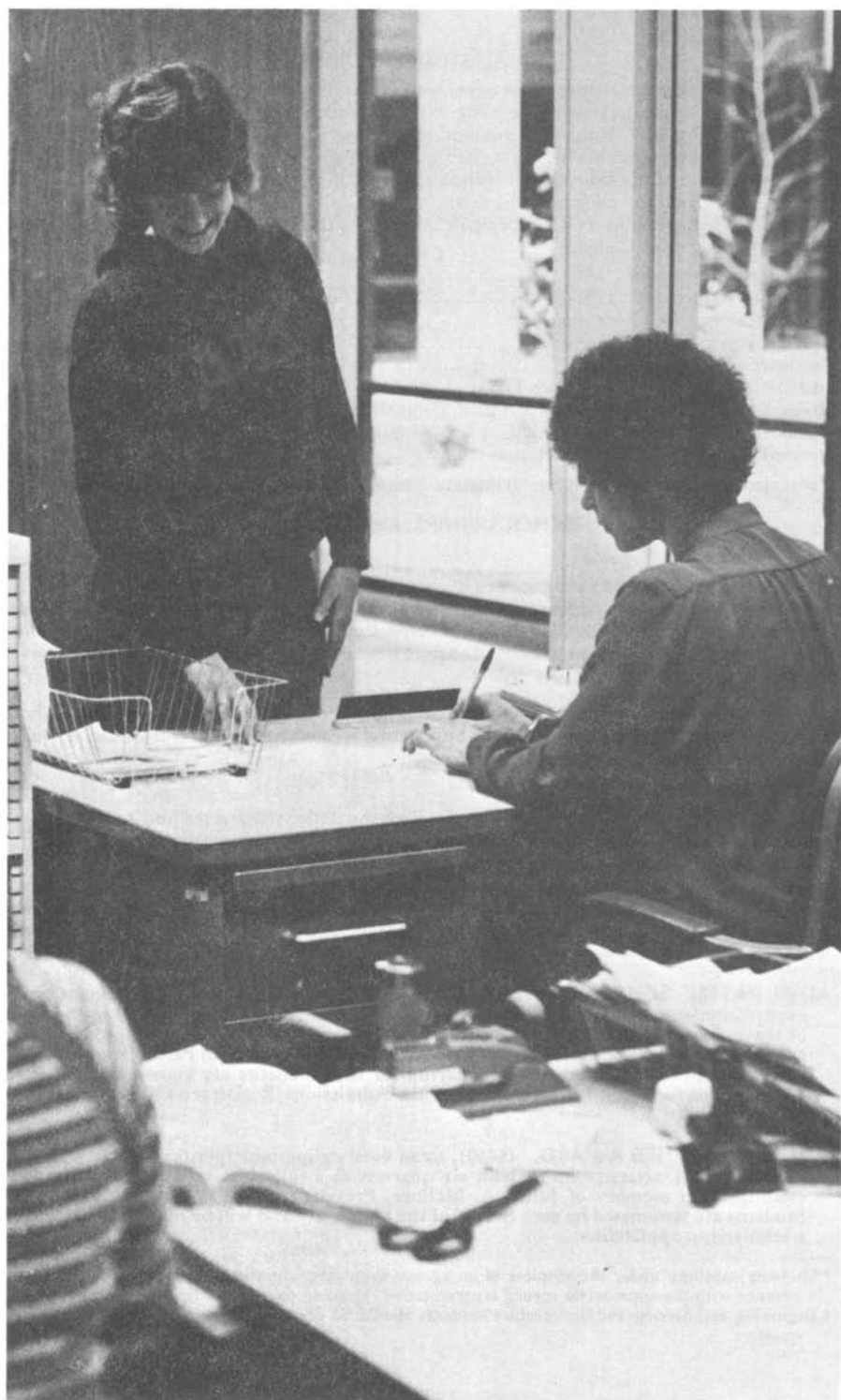
Generally, students must have at least a "B" average to place high enough in the scholarship ratings to be granted an award. However, there are scholarships which are granted to students with a lesser grade average. In some cases need, special qualification, or a specific field of study will compensate for a lower grade average. It is recommended that a student apply if in doubt.

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 or College, according to the Alan Pattee Scholarship Act *Education Code* 68121. Students qualifying for these benefits are known as Alan Pattee scholars. For further information contact the Admissions/Registrar's Office, which determines eligibility.

JULIAN A. McPHEE AWARD, (\$450), to an outstanding undergraduate student who has attended the University for at least six quarters as a full-time student. This award was established in memory of Julian A. McPhee, President of Cal Poly from 1933 to 1966. Students are nominated by each School of the University and will be requested to complete a scholarship application.

* Students enrolling under the auspices of an agency supplying educational assistance should check in advance with the appropriate agency representative regarding payment of fees and/or costs.

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



GENERAL SCHOLARSHIPS

Freshman Scholarships
 Lulu G. Bumphrey Scholarship
 Freshman or Advanced Student Scholarships
 R. W. Andrews Scholarships
 Bankamerica Foundation Scholarships
 Mercedes Berry
 Memorial Scholarships
 California Polytechnic State University
 Memorial Scholarships
 California Polytechnic State University
 Wives' Club Scholarship
 California Rural Rehabilitation Corporation
 Education Fund Scholarships
 Claire Davis Clark Scholarship
 Charles Wyndham Flanagan Scholarship
 Bing Crosby Youth Fund Scholarship
 Ferini-Ardantz Scholarship
 Helen V. Sandercock Scholarship
 William and Adelaide V. Sandercock
 Scholarship
 William B. Turner Scholarships
 J. Van Dyke Memorial Scholarship
 Advanced Student Scholarships
 California Polytechnic State University
 Wives' Scholarships
 Herbert E. Collins Scholarship
 Green and Gold Barbecue Scholarship
 Julian A. McPhee Scholarship
 Mustang Daily Scholarships

AGRICULTURE AND NATURAL RESOURCES

Freshman Scholarships
 California State Grange Scholarships
 E. C. Loomis and Son Scholarship
 San Luis Obispo County Cowbelles
 Scholarships
 Freshman or Advanced Student Scholarships
 Paul Belveal Memorial Forestry Scholarship
 California Cowbelles Scholarship
 Agnese Davey Scholarship
 Ray Hansen Memorial Scholarship
 Knudsen Foundation Scholarship
 Poultrymen's Cooperative Association
 Scholarship
 Leopold Edward Wrasse Scholarships
 Advanced Student Scholarships
 L. L. Bennion Scholarship
 Danny Bettencourt Memorial Scholarship
 California Dairy Industries Association
 Scholarship
 California Fertilizer Association Soil
 Improvement Committee Scholarship
 Earl J. Cecil Educational Foundation
 Scholarships
 Wellington Davey Scholarship
 General Dillingham Produce Industry
 Scholarship
 Dorothy Bancroft Drasel Scholarship
 Paul Ecke Ranch Scholarship
 Paul Etchechury Memorial Scholarship
 William Randolph Hearst Foundation
 Scholarship
 Alvin H. Hollenberg Memorial Scholarship
 William (Ben) and Helen Holman Alumni
 Agriculture Scholarship
 Robert Matthew Kies Scholarship
 Kings River Prune and Apricot Scholarship
 Los Angeles County Fair Association
 Scholarship
 Los Lecheros Dairy Club Financial
 Scholarship
 James F. Merson Memorial Scholarship
 Stevan H. Mueller Scholarship
 Natural Resources Management Scholarship
 Don Nikkel Memorial Scholarship
 Harry Parker Memorial Scholarship
 Rain for Rent, Inc. Irrigation Scholarship in
 Memorial of Paul Etchechury
 Rancho Santa Fe Garden Club Scholarship
 Rancho Soledad Nurseries Scholarship
 Florance G. Ray Memorial Scholarship
 Harry Rosedale Memorial Scholarship
 San Diego Geranium Society Scholarship
 San Luis Obispo Lions Club/Food
 Industries Scholarship
 Santa Barbara County Horticulture Society
 Scholarship
 Tractor and Equipment Club of California
 Scholarship
 Eric C. Twist Memorial Scholarship
 Western Growers Association Scholarships

ARCHITECTURE AND ENVIRONMENTAL DESIGN

Advanced Student Scholarships
 Wallace W. Arendt Scholarship
 Bechtel Corporation Scholarship
 California Portland Cement Company
 Scholarship
 D. Stewart Kerr Architectural
 Scholarship Fund
 Warren Ludvigsen Memorial Scholarship

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Julia Morgan/Phoebe Hearst Architecture
Scholarship

Frederick Peter Young Scholarship

BUSINESS

Freshman or Advanced Student Scholarships
Central Coast Chapter Society of
California Accountants' Accounting
Scholarship
Channel Counties CPA Society Scholarship
H.S. Crocker Company—Roland Meyer
Memorial Scholarship
Frank and Norma Exter Scholarship

Charles Wyndham Flanagan Scholarship
Getty Oil Company Scholarship
Glenn, Burdette, Schuetz & Booker
Accountants, Inc. Scholarship
Advanced Student Scholarships
Arthur Andersen and Company Meritorious
Scholarship
Ernst and Whinney Foundation Scholarship

COMMUNICATIVE ARTS AND HUMANITIES

Freshman or Advanced Student Scholarships
H. S. Crocker Company—Roland Meyer
Memorial Scholarship

Janet Gardner Scholarship
Catherine Truchan Memorial Scholarship
Advanced Student Scholarships
NAPP Systems, Inc.

ENGINEERING AND TECHNOLOGY

Freshman or Advanced Student Scholarships
Alcoa Foundation Scholarship
American Institute of Aeronautics and
Astronautics, Vandenberg Section
Scholarship
American Society of Heating, Refrigeration
and Air-Conditioning Engineers Scholar-
ships—Southern California Chapter
Bechtel Corporation Scholarship
The Boeing Company Scholarship
Comm-Air-Energy Conservation
Scholarship
FMC Corporation Scholarship
Harold R. Frank—Applied Magnetics
Corporation Scholarship
Getty Oil Company Scholarship
Industrial Technology Scholarship and
Development Fund
Institute of Electrical & Electronics
Engineers, Santa Barbara Section
Scholarships

Institute of Traffic Engineers, Central
California Section Scholarship
Ken Kirk Memorial/San Francisco Chapter
of the American Society of Plumbing
Engineers Scholarship
Charles S. Osborne, Jr. Scholarship
John W. Page Foundation Scholarships
Frank E. Pilling, Sr., Scholarship
Roy N. Poage Memorial Scholarship
Clarence Radius Memorial Scholarship
Raytheon Company Scholarship
Society of Manufacturing Engineers Student
Chapter Scholarship
Advanced Student Scholarships
Peter Kiewit Son's Company Scholarship
Elgin P. Knott Memorial Scholarship
Johns-Manville Fund, Inc. Scholarship

HUMAN DEVELOPMENT AND EDUCATION

Freshman Scholarships
San Luis Obispo County Cowbelles
Scholarship

Advanced Student Scholarships
Marjorie Martinson Scholarship
Parent-Teachers Scholarship
Larry S. Ratner Scholarship
Mildred Shepard Scholarship

SCIENCE AND MATHEMATICS

Advanced Student Scholarships
Applegarth Biology Scholarship
Beta Beta Beta Biological Society
Scholarship

Dr. Clyde P. Fisher Memorial Scholarship
Hatfield Memorial Award
Robert E. Holmquist Memorial Scholarship
W. B. Judd Scholarship

Barbara Lee Lincoln Memorial Award
Sierra Vista Hospital Volunteers Auxiliary
Scholarship

Harold J. Watson Memorial Scholarship

ATHLETICS

Robert A. Mott Scholarship
Jon R. Dana Memorial Scholarship

Cal Poly Aquatic Scholarships
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 or to the Financial Aid Office.

LOANS

Loans are generally for education purposes only, with definite provisions for repayment. These loans are of four types, the National Direct Education Act loans, United Student Aid Fund, Guaranteed Loan, and the University long-term education loan. Also available are emergency loans of small amount, interest free for short-term period.

NATIONAL DIRECT EDUCATION ACT LOAN

The National Direct Student Loan can provide up to \$3,000 per year with a maximum of \$6,000 to an eligible undergraduate. Loans are also available to eligible graduate students. Repayment of principal and interest (4% on unpaid balance) begins six months after the student leaves the University. There are cancellation provisions for teaching in designated areas, teaching the handicapped, or teaching in a Head Start Program. Applications for this program are due by March 1 of each year for the following college year.

STUDENT LOAN FUNDS

Student loan funds are available to provide temporary assistance to eligible students. Loans from these funds are made for varying periods of time, according to regulations determined by a faculty committee and in conformance with conditions prescribed in the establishment of the particular loan fund. Applications may be obtained from the Financial Aid Office.

Institutional Long-Term Loans

Educational long-term loans are granted to students who demonstrate a need. They are approved by a standing committee on the basis of written applications, recommendations, and interviews. Promissory notes signed by the borrower and a cosigner are required. Amounts of up to \$500 may be borrowed per academic year. Interest is charged on the unpaid balance beginning six months after the date of graduation or withdrawal from the university. Repayment of the loan begins one year after graduation or withdrawal. Contributions to the long-term loan fund are:

Jed S. Blake Memorial Loan Fund
Herbert E. Collins Student Loan Fund
1960 Football Memorial Loan Fund

Fred Kimball Loan Fund
Norma Sullivan Memorial Loan Fund

One-Year Loans

The university has additional funds for emergency loans. Up to \$200 can be borrowed from these funds during a school year. Repayment is required by the following August 1 with 6% interest charged on the unpaid balance.

Contributors to this fund include:

Agricultural Engineering Society Loan
Fund
Alpha Zeta Loan Fund
Alumni Association Loan Fund
American Society of Heating, Refrigeration
and Air Conditioning Engineers Loan
Fund

American Welding Society Loan Fund
Lamar Anderson Memorial Student Loan
Fund
Peter Bachino Memorial Loan Fund
Baer-Beck Fund
Edgar E. Bilodeau Loan Fund

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California Association of Refrigeration Fund
Service Engineers Loan Fund
California Association of Soil Conservation Districts Loan Fund
California Polytechnic Memorial Loan Fund
California Retired Teacher's Loan Fund
California Polytechnic State University Wives' Club Fund
W.B. Camp Educational Loan Fund
Logan S. Carter Loan Fund
Margaret Chase Memorial Loan Fund
Thomas Comer Memorial Loan Fund
Harlan Diedrichsen Memorial Loan Fund
Court Evergreen, Independent Order of Foresters Loan Fund
Barbara Hammonds, Memorial Loan Fund
John Holley Memorial Loan Fund
Ralph Hoover Loan Fund
Horsehoeing and Animal Husbandry Loan Fund
Industrial Technology Scholarship and Development Fund
International Students Emergency Loan

University Emergency Loans

Short-term loans in amounts up to \$50 can be borrowed quarterly with payment due by the end of the quarter.

GUARANTEED STUDENT LOAN PROGRAM

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 a 9% 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 9% per year on the unpaid balance. Deadlines vary according to the lending agency as do maximum amounts loaned.

SUPPLEMENTAL EDUCATIONAL OPPORTUNITY GRANT PROGRAM

A grant-in-aid program 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.

BASIC EDUCATIONAL OPPORTUNITY GRANT PROGRAM (PELL GRANTS)

This is a Federal aid program designed to provide financial assistance to those who need it to attend post-high school education institutions.

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.

COLLEGE WORK STUDY PROGRAM

The University is participating in the College Work Study Program which provides students who are eligible the opportunity of employment as set forth under the Economic Opportunity Act. Employment provisions under this program are parallel to those of other student employment on campus. Rates of pay vary depending on the job requirements and the skills of the worker. Student Aid Application for California is required. Information may be obtained from the Financial Aid Office.

School of Agriculture and Natural Resources

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SCHOOL OF AGRICULTURE AND NATURAL RESOURCES

Howard C. Brown, 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 business 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 provide 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, and 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, but does not require that a specific pattern of courses be taken in high school. However, 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.

MASTER OF SCIENCE IN AGRICULTURE

The School of Agriculture and Natural Resources offers a program of graduate study leading to the degree of Master of Science in Agriculture. This broadly based program is designed to develop professional competencies for positions in agriculture and related industries, teaching, business, and government work which now require levels of preparation beyond the baccalaureate degree. Specializations are currently available in the areas of General Agricultural Sciences, International Agriculture, Mechanized Agriculture, and Soil Conservation.

CURRICULUM FOR THE MASTER OF SCIENCE IN AGRICULTURE DEGREE WITH A SPECIALIZATION IN GENERAL AGRICULTURAL SCIENCES

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

	<i>Units</i>
Courses in area of specialization	24
The 24 units of 300, 400, or 500 series courses must be distributed among a minimum of three departments in the School of Agriculture and Natural Resources. Fifteen units must be 500 series. No more than 9 units may be approved in AG 599, Thesis, or AG 539, Internship, or any combination of the two.	
Courses to be selected from 300, 400, or 500 series courses as approved by the student's graduate committee. Eight units must be 500 series.	<u>21</u>
	45

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

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

	<i>Units</i>
Courses in the area of specialization:	
AM 515 International Agricultural Marketing	3
AM 516 Communication for Change in Developing Countries	3
AM 510 World Agricultural Development	3
Courses in agriculture in the 500 series as approved by the student's graduate committee, at least 8 units:	8
Courses in agriculture to be chosen from the 300 series or above	<u>7</u>
	24
Courses outside the area of specialization	
AGED 580 Special Problems in Agricultural Education	3
POLS 510 Administration in Developing Nations	3
Courses selected from the following:	
Geography, Political Science and History of one selected world regional area (Latin America, Africa south of the Sahara, North Africa and the Middle East, or Asia and the Far East), 300 or 400 series courses as approved by the student's graduate committee.	9
The student must develop and demonstrate language competency as required by the graduate committee.	15
Electives from 300, 400, and 500 series courses	<u>6</u>
	45

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

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

	<i>Units</i>
Courses in the area of specialization:	
Courses in the 500 series as approved by the student's graduate committee	12
AE 581 Graduate Seminar in Agricultural Engineering	3
AG 599 Thesis, or approved courses.....	<u>9</u>
	24

Courses other than in the area of specialization:

Courses to be selected from the 300-400-500 series outside the area of specialization and approved by the student's graduate committee. At least six units must be in 500 series courses	15
Electives from 300, 400, and 500 series courses	6
	<u>45</u>



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

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

Courses in the area of specialization:		<i>Units</i>
NRM 502 Resource Conservation	3	
SS 508 Conservation Legislation	3	
SS 521 Soil Morphology	3	
SS 581 Graduate Seminar in Soils	3	
SS 582 Graduate Seminar in Land Management	3	
AG 599 Thesis, or approved courses	9	
		24

Courses other than in the area of specialization:

Courses to be selected from the 300-400-500 series outside the area of specialization and approved by the student's graduate committee. At least six units must be in 500 series courses	15
Electives from 300, 400, and 500 series courses	6
	<u>45</u>

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, dairy husbandry and manufacturing, crop science, fruit science, food science, ornamental horticulture, and poultry industry. These curricula include a smaller number of units of related and general education 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 selected 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 department heads.

Freshman	F	W	S
Feeds and Feeding (ASCI 101)	4		
Market Beef Production (ASCI 111)	3		
Elements of Swine Production (ASCI 112)		3	
Elements of Sheep Production (ASCI 113)			3
Agricultural Mechanics (AE 121 or 122)		2	
Agricultural Engineering elective			2
English Composition course	3		
Agricultural Math (MATH 102)		3	
Physical Education activity			1
* Agricultural Biology (BIO 099)		3	
Soils (SS 121)			4
† Electives	<u>7</u>	<u>6</u>	<u>7</u>
	17	17	17
Sophomores			
Applied Beef Cattle Management (ASCI 241)	2		
Applied Swine Management (ASCI 242)		2	
Applied Sheep Management (ASCI 243)			2
Agricultural Engineering electives	4		
* Principles of Livestock Hygiene and Sanitation (VS 099)		5	
Forage Crops (CRSC 123)			4
* Farm Records (AM 099)	4		
Health Education (PE 250)			2
* U.S. History and Government (POLS 099)		3	
Agricultural Management electives	3		
† Electives	<u>3</u>	<u>6</u>	<u>7</u>
	16	16	15

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

The following specialization areas are available to two-year technical students in Animal Science: Beef Cattle Production, Horse Production, Feed Mill Operation. One of these may be selected with the approval of the adviser.

* 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.

All two-year technical students are required to take MATH 102. Students in Mechanized Agriculture are required to take MATH 102 and 103.

† 11 units of 100-200 level ASCI, DH, DM, FDSC, PI, and 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 3,500 and 4,000 birds. The equipment includes a modern incubator, egg-handling facilities, brooders and brooder houses, pens for trap-nesting and pedigree work, and related devices. A student assistant and the students themselves care for every operation under the supervision of the department head.

The Ornamental Horticultural Department occupies a unit consisting of twelve 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 Crops and Farm Departments 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 has 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, Larry P. Rathbun

Alan S. Damann

Joseph E. Sabol

Keith V. Smith

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 B.S. degree in any of the agricultural science production or management fields. Course work toward the teaching credential should be started early in order most effectively to complete the total curriculum.

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 post graduate course work necessary for the "clear" teaching credential, after receiving the preliminary teaching credential.

Agricultural education courses may be used to fulfill twenty-four of the forty-five units required for the Master of Science in Agriculture degree with a specialization in General Agricultural Sciences. 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.

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CURRICULUM IN AGRICULTURAL SCIENCE

	F	W	S
Freshman			
General Animal Science (ASCI 230)	4		
General Dairy Husbandry (DH 230)			4
Agronomic Production (CRSC 230/FRSC 230/VGSC 230)	4	4	
Agricultural Mechanics (AE 121 or 122)		2	
Agricultural Tractors and Equipment Skills (AE 141)			3
Introduction to Agricultural Education (AGED 202)	2		
General Botany (BOT 121)		4	
General Zoology (ZOO 131)			4
Mathematics (MATH 102 or 113)	3		
Freshman Composition (ENGL 114)	4		
Electives and courses to complete major		7	4
	17	17	15
Sophomore			
Soils (SS 121)			4
Agricultural Business Sales and Service (AM 201)	3		
Ornamental Gardening (OH 230)		3	
General Poultry Production (PI 230)	3		
Manufacturing Processes (ETWT 144)			2
* Agricultural Mechanics (AE 335 or 339)	3		
F.F.A. Programs and Activities (AGED 303)			2
Supervised Agricultural Experiences (AGED 339)			2
General Chemistry (CHEM 121)	4		
General Psychology (PSY 202)			3
Economics (ECON 201)		3	
Principles of Speech (SP 200)		3	
† Anthropology or Sociology elective		3	
Electives and courses to complete major	3	4	3
	16	16	16
Junior			
Agricultural Marketing (AM 301)		3	
Farm Records (AM 321)			4
Drug Education (PE 305)		2	
Learning Process (ED 335)	3		
Multicultural Education (ED 301)	3		
American and California Government (POLS 201)			3
Growth of American Democracy (HIST 204)	3		
The United States in World Affairs (HIST 205)		3	
† Literature or Philosophy elective (upper division)		3	
Principles of Business Data Processing (CSC 120)			3
Advanced Composition (ENGL 300)	3		
† Literature elective			3
Agriculture courses to complete major	5	6	3
	17	17	16
Senior			
Senior Project (AGED 461, 462)	2	2	
Instructional Processes in Agricultural Education (AGED 438)	3		
Diagnosis, Prescription and Evaluation (ED 436)	2		
Practicum or Seminar (AGED 441 or AGED 463)		2	

* Students with Agricultural Mechanics Concentration take AE 335.

† To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Field Experience in Reading Methods (ED 434)	2		
Methods of Teaching Reading (ED 435)		3	
• Philosophy elective	3		
Health Education (PE 250)			2
Agriculture/Agricultural Education electives			8
Agricultural Labor Relations and Personnel Management (AM 401) ..			4
• Art, Music, or Theatre elective.....		3	
• Art, Humanities, Spanish elective		3	3
Electives and courses to complete major	4	5	17
	16	18	17



* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

AGRICULTURAL ENGINEERING DEPARTMENT

Department Head, Jack D. Wilson

James Bermann	Robin R. Grinnell	Rodger E. Vierra
Charles M. Burt	Lloyd H. Lamouria	James P. Webster, Jr.
Edgar J. Carnegie	Willard H. Loper	Gary Weisenberger
Frank G. Coyes	Glenn W. Salo	James B. Zetsche, Jr.
Larry J. Glass	Rollin D. Strohman	

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, and computers and microprocessors.

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 of: 1) water management systems, including those for irrigation, drainage, hydrology, flood control and soil conservation; 2) farm machinery; 3) food processing systems; and 4) agricultural structures. Manufacturing firms, consulting engineering firms, and government are the primary employers.

The curriculum is accredited by 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. Nineteen units of free 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
Agricultural Mechanics (AE 128)	3		
Power and Machinery (AE 143)		4	
Engineering Surveying (AE 237)			2
Manufacturing Processes (ETMP 144)	2		
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
Freshman Composition (ENGL 104, 105)	3	3	
Applied Descriptive Geometry (ETME 141)		2	
Engineering Drawing Systems (ETME 142)			2
Soils (SS 121)	4		
Manufacturing Processes (ETWT 144)			2

	F	W	S
General Chemistry (CHEM 121, 122)		4	4
* Agriculture Elective			3
	16	17	17
Sophomore			
Agricultural Structures Planning (AE 232)			3
Principles of Irrigation (AE 236)	4		
Economics (ECON 211)			3
Digital Computer Applications (ENGR 251)		2	
* Life Science elective		3	
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
General Physics (PHYS 131, 132, 133)	4	4	4
Engineering Mechanics (ME 211, 212)		3	4
† Literature or Philosophy elective			3
General Psychology (Psy 202)	3		
Agriculture elective	3		
	18	16	17
Junior			
Hydraulics (AE 312)	4		
Hydrology (AE 315)		3	
Off-the-Road Locomotion (AE 326)		3	
Irrigation Theory (AE 331)		3	
Engineering Properties of Agricultural Materials (AE 333)			3
Dynamic Measurement (AE 338)			3
Heat Transfer (ENVE 313)		3	
Electrical Circuit Theory (EE 201)	3		
Electric Circuits Laboratory (EE 261)	1		
Thermodynamics (ME 302)	3		
Strength of Materials (CE 208, 209)		3	3
American and California Government (POLS 201)			3
Statistical Analysis (STAT 321)	3		
† Art, Music, Theatre or Foreign Language electives		3	3
Principles of Speech (SP 200) or Public Speaking (SP 201)	3		
Health Education (PE 250)			2
	17	18	17
Senior			
Agricultural Systems Engineering (AE 403)			3
Irrigation Engineering (AE 414)			4
Equipment Engineering (AE 421, 422)	4	3	
Agricultural Structures Design (AE 433)	4		
Agricultural Process Engineering (AE 427)		3	
Senior Project (AE 461, 462)	2	2	
Undergraduate Seminar (AE 463)	2		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Engineering Economics (IE 414)	3		
† Philosophy elective		3	
† Literature elective			3
† ANT/ECON/GEOG/POLS/PSY/SOCS/SOC elective			3
Human Values (HUM 402)		3	
	15	17	16

* At least 4 of the elective units must be selected from courses in the School of Agriculture and Natural Resources.

† To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (See adviser or department office.)

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CURRICULUM IN MECHANIZED AGRICULTURE

Freshman	F	W	S
Agricultural Mechanics (AE 128)		3	
Agricultural Drafting (AE 133)	3		
Agricultural Tractors and Equipment Skills (AE 141)	3		
Power and Machinery (AE 143)			4
Algebra (MATH 113)	3		
College Algebra (MATH 114)		3	
Trigonometry (MATH 115)			3
Freshman Composition (ENGL 104, 105)	3	3	
Manufacturing Processes (ETMP 144, 145)	2	2	
Manufacturing Processes (ETWT 144)		2	
Fundamentals of Metallic Arc Welding (ETWT 155)			1
Plant Production elective			4
Soils (SS 121)		4	
Animal Production elective			4
Health Education (PE 250)	2		
	16	17	16
Sophomore			
Agricultural Business Sales and Services (AM 201)	3		
Basic Accounting (ACTG 131)			3
Agricultural Building Construction (AE 231)	3		
Agricultural Electrification (AE 134)	3		
Agricultural Power Transmission (AE 234)		3	
Agricultural Power (AE 335)		3	
Engineering Surveying (AE 237)	2		
Gasoline Engine Diagnosis (AE 341)			3
Computer Application to Agriculture (AM 250)	3		
College Physics (PHYS 121, 122, 123)	4	4	4
* Life Science elective		3	
Principles of Speech (SP 200)			3
Electives		3	3
	18	16	16
Junior			
Principles of Agricultural Machinery (AE 322)		4	
Agricultural Products Handling (AE 323)			3
Principles of Agricultural Electrification (AE 324)		4	
Irrigation (AE 340)	4		
Project Analysis (AE 343)	5		
Agricultural Equipment Projects (AE 344)		3	
General Chemistry (CHEM 121, 122)	4	4	
General Psychology (PSY 202)			3
Corporate Communications (ENGL 310)	3		
Business Law Survey (BUS 201)			3
Economics (ECON 201 or 211)			3
* ART, FOR LANGS, MU, or TH elective		3	3
† Electives			3
	16	18	18

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

† 8 units must be selected from courses in the School of Agriculture and Natural Resources.

Senior	F	W	S
Closed Circuit Hydraulics (AE 301).....	3		
Agricultural Building Planning (AE 432).....			4
Electrical and Electronic Controls for Agriculture (AE 425).....			3
Senior Project (AE 461, 462)	2	2	
Undergraduate Seminar (AE 463).....	2		
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Principles of Engineering Economics (IE 403) or Agricultural Credit and Finance (AM 310)	3		
• Literature elective	3		
• Philosophy elective		3	
• ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives			3
Human Values (HUM 402)		3	
Agricultural Policy (AM 312)		3	
† Electives		3	3
	16	17	16

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



* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† 8 units must be selected from courses in the School of Agriculture and Natural Resources.

AGRICULTURAL MANAGEMENT DEPARTMENT

Department Head: Acting, M. LeRoy Davis

James J. Ahern	Douglas G. Genereux	John A. Rogalla
Renny J. Avey	George J. Hellyer	David J. Schaffner
Roger H. Bishop	John J. Herlihy	Jack F. Scott
Steven C. Blank	H. Clay Little	Duane O. Seaberg
Gaylord J. Chizek	Robert E. McCorkle	Martin D. Vix
Arthur C. Duarte	Nancy C. Morris	

The Agricultural Management curriculum 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 young people for careers in the management and operations 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, economics, as well as courses in general education areas of English, mathematics, history, political science and psychology.

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

Students can select courses in specific areas in addition to the two major directions of the program.

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 are also available to these graduates.

CURRICULUM IN AGRICULTURAL MANAGEMENT

Freshman	F	W	S
Introduction to Agricultural Management (AM 101)	3		
Introduction to Agricultural Economics (AM 102)		3	
Mathematics (MATH 113, 114)		3	3
Principles of Speech (SP 200)			3
Freshman Composition (ENGL 104)	3		
* Literature elective		3	
Physical Education activity	1	1	
* Art, Music, or Theatre elective.....		3	
* Life Science elective with lab			4

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Introduction to Crop Science (CRSC 131) or Pomology (FRSC 131) ..	4		
Feeds and Feeding (ASCI 101)			4
* Electives	<u>5</u>	<u>3</u>	<u>2</u>
	16	16	16
Sophomore			
Principles of Economics (ECON 211)	3		
Agricultural Economics (AM 212)		3	
Agricultural Economic Analysis (AM 213).....			4
Principles of Accounting (ACTG 221, 222)		4	4
Elementary Probability and Statistics (STAT 211)	3		
Statistical Methods (STAT 212)		3	
General Chemistry (CHEM 121, 122)	4	4	
Computer Application to Agriculture (AM 250).....			3
Soils (SS 121)	4		
* Electives and courses to complete the option	<u>3</u>	<u>3</u>	<u>6</u>
	17	17	17
Junior			
Agricultural Marketing (AM 301).....	3		
Agricultural Cooperative Organization and Management (AM 302)		3	
Agricultural Credit and Finance (AM 310)	3		
Agricultural Policy (AM 312)		3	
Principles of Farm Management (AM 322)		4	
Agricultural Management Research (AM 360)			3
Science elective (Life Science with lab or CHEM 226).....			4
American and California Government (POLS 201)		3	
Advanced Composition (ENGL 300)	3		
† Literature or Philosophy elective.....	3		
General Psychology (PSY 201 or PSY 202)			3
* Electives and courses to complete the option	<u>5</u>	<u>4</u>	<u>7</u>
	17	17	17
Senior			
Agricultural Labor Relations and Personnel Management (AM 401) ..	4		
Business Law (BUS 207)		4	
Corporate Communications (ENGL 310)		3	
American Democracy and World Affairs (HIST 206)			5
Ethics (PHIL 331).....		3	
Senior Project (AM 461, 462)	2	2	
† ART, FOR LANGS, LIT, PHIL elective	5		
Undergraduate Seminar (AM 463)			2
* Electives and courses to complete the option	<u>5</u>	<u>4</u>	<u>9</u>
	16	16	16

* Electives must include 18 units to be selected in agriculture with prefixes other than AM. Of these units, 6-8 must be selected from the following courses: AE 340, ASCI 302, CRSC 221, CRSC 311, SS 221, VS 203, VS 302.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

AGRICULTURAL BUSINESS MANAGEMENT OPTION

(Add Courses Below to Basic Curriculum)

Sophomore

- AM 201 Agricultural Business Sales and Service (3)
 AM 203 Agricultural Business Organization (3)

Junior

- AM 323 Agricultural Business Managerial Accounting (4)
 AM elective (3)
 AM 324 Agricultural Property Management (4)

Senior

- AM 404 Agricultural Marketing Management (3)
 AM 405 Agricultural Marketing Research Methods (3)
 AM 406 Agricultural Business Communication (3)
 AM 421 Agricultural Business Operations Analysis (4)



FARM MANAGEMENT OPTION

(Add Courses Below to Basic Curriculum)

Sophomore

- AM 305 Agricultural Resources (3)

Junior

- AM 326 Farm Appraisal (4)
 AM 413 Crop Management Problems .. (3)
 AM 427 Agricultural Estate Planning .. (4)
 AM elective (3)

Senior

- AM 415 or 416 Livestock or Dairy Management Problems (3)
 AM 431 Large Farm Accounting (4)
 AM 433 Agricultural Price Analysis (3)
 AM 435 Linear Programming in Agriculture (3)

ANIMAL AND VETERINARY SCIENCE DEPARTMENT

Department Head, Richard F. Johnson

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

The objective of the Department is to educate 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, 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 broodmare 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 is also 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 three special interest clubs and the sponsorship of championship-calibre national intercollegiate teams in rodeo, livestock judging, horse showing, and polo.

CURRICULUM IN ANIMAL SCIENCE

Freshman	F	W	S
Feeds and Feeding (ASCI 101)	4		
Market Beef Production (ASCI 111)		3	
Elements of Swine Production (ASCI 112)	3		
Elements of Sheep Production (ASCI 113)			3
Agricultural Mechanics (AE 121 or 122)	2		
Freshman Composition (ENGL 104)	3		
Freshman Composition (ENGL 105)		3	
Mathematics (MATH 102, 114)	3	3	
Health Education (PE 250)		2	
General Zoology (ZOO 131, 132)		4	4
Applied Beef Cattle Management (ASCI 241)		2	
Applied Swine Management (ASCI 242)	2		
Applied Sheep Management (ASCI 243)			2
Library Instruction (LIB 101)			1
Principles of Speech (SP 200)			3
Electives			4
	17	17	17

84 Animal and Veterinary Science

	F	W	S
Sophomore			
† Animal Science electives	4	3	
Agricultural Engineering electives	2	2	
Anatomy and Physiology (VS 123)		3	
Soil Science (SS 121)			4
General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
General Bacteriology (BACT 221)	4		
General Botany (BOT 121)		4	
Forage Crops (CRSC 123)			4
Meats (FDSC 210)			3
Electives	2		2
	<u>16</u>	<u>16</u>	<u>17</u>
Junior			
Applied Animal Nutrition (ASCI 302)		3	
Animal Hygiene (VS 302)	3		
Animal Parasitology (VS 203)		3	
† Animal Science electives			4
American and California Government (POLS 201)	3		
General Psychology (PSY 202)			3
Genetics (BIO 303)		3	
Economics (ECON 201)	3		
Farm Records (AM 321)		4	
Farm Management (AM 322)			4
Biochemistry (CHEM 328)			4
Business elective	3		
* Electives	4	3	2
	<u>16</u>	<u>16</u>	<u>17</u>
Senior			
Animal Breeding (ASCI 304)		3	
Reproductive Physiology (ASCI 401)	4		
Animal Nutrition (ASCI 402)		4	
Senior Project (ASCI 461, 462)	2		2
Undergraduate Seminar (ASCI 463)		2	
* Literature/Philosophy electives	3	3	
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives			3
U.S. in World Affairs (HIST 205)			3
Growth of American Democracy (HIST 204)	3		
† Animal Science electives	2	1	6
Agricultural Management elective (300–400 level)		3	
* Electives	3		2
	<u>17</u>	<u>16</u>	<u>16</u>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Animal Science and Veterinary Science and other subjects. Please see page 100 for additional information.

† 20 units to be selected from courses in ASCI, DH, FDSC, PI, VS. 13 units to be 200–400 level; at least 7 units must be at the 300–400 level.

* To be selected in accordance with the General Education-Breadth requirements. (See department office or adviser for specific requirements.)

CROP SCIENCE DEPARTMENT

Department Head, Corwin M. Johnson

Charles B. Atlee	George G. Gowgani	Sherman A. Phillips, Jr.
A. Charles Crabb	Louis W. Harper	Howard Rhoads
H. Paul Fountain	Robert J. McNeil	Gordon L. Van De Vanter
Alan L. Foutz	Gene P. Offermann	David L. Warfield
Gregory L. Ganick	John C. Phillips	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 the 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, and Plant Protection in the junior and senior years.

CURRICULUM IN CROP SCIENCE

Freshman	F	W	S
Introduction to Crop Science (CRSC 131)	4		
Grain Crops (CRSC 132)		4	
Row Crops (CRSC 133)			4
Agricultural Engineering electives	4		4
General Botany (BOT 121, 122 or 123)	4	4	
Freshman Composition (ENGL 104, 105 and 218)	3	3	3
Library Instruction (LIB 101)			1
Mathematics (MATH 102, 103)		3	3

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	F	W	S
Health Education (PE 250)	2		
* Anthropology or Sociology elective.....			3
	17	15	17
Sophomore			
Weed Control (CRSC 221)	4		
Commercial Seed Production and Processing (CRSC 231)		4	
Vegetable Crops Production (VGSC 232)			4
General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
Soils (SS 121)	4		
Soil Management (SS 122)		4	
Fertilizers (SS 221)			4
Principles of Speech (SP 200)			3
General Psychology (PSY 202)	3		
Economics (ECON 211)		3	
Electives	2	2	2
	17	17	17
Junior			
General Bacteriology (BACT 221)	4		
Experimental Techniques and Analysis (CRSC 411)		4	
Farm Records (AM 321)	4		
Agricultural Labor Relations and Personnel Management (AM 401) ..		4	
Biochemistry (CHEM 328)	4		
California Fruit Growing (FRSC 230)			4
Plant Pathology (BOT 323)			4
American and California Government (POLS 201)	3		
‡ Growth of American Democracy (HIST 204)		3	
‡ U.S. in World Affairs (HIST 205)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective	2	4	
† Electives			6
	17	15	17
Senior			
Plant Breeding (CRSC 304)			4
Senior Project (CRSC 461, 462)	2	2	
Undergraduate Seminar (CRSC 463)			2
Genetics (BIO 303)	3		
Applied Insect Pest Management (CRSC 311)	4		
Crop Physiology (CRSC 410)		4	
* Literature and Philosophy electives.....	3	3	3
* ART, MU, FOR LANGS, or TH elective			3
† Electives	4	7	5
	16	16	17

CURRICULUM IN FRUIT SCIENCE

Freshman

Pomology (FRSC 131, 132, 133)	4	4	4
Mathematics (MATH 102, 103)	3	3	

‡ Students may take HIST 206 (5) plus one additional elective unit instead of HIST 204 and 205 (6).

† At least four courses to be selected with the approval of the adviser three of which must be 300-400 series courses.

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Agricultural Engineering electives	2	2	4
Freshman Composition (ENGL 104, 105 and 218)	3	3	3
Health Education (PE 250)		2	
General Botany (BOT 121, 122 or 123)	4	4	
Anthropology or Sociology elective.....			3
* Electives			2
Library Instruction (LIB 101)			1
	16	17	17
Sophomore			
Viticulture (FRSC 231)	4		
Fruit Plant Propagation (FRSC 232)		4	
General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
Soils (SS 121)	4		
Soil Management (SS 122)		4	
Plant Pathology (BOT 323)			4
Weed Control (CRSC 221)			4
Principles of Speech (SP 200)	3		
Agricultural Engineering electives	2		
Economics (ECON 211)		3	
* Electives		2	5
	17	17	17
Junior			
General Bacteriology (BACT 221)		4	
Applied Insect Pest Management (CRSC 311).....	4		
Experimental Techniques and Analysis (CRSC 411)			4
Biochemistry (CHEM 328)		4	
Genetics (BIO 303)	3		
Fertilizers (SS 221)			4
Farm Records (AM 321)	4		
General Psychology (PSY 202)	3		
† ART/FOR LANGS/HUM/LIT/PHIL/MU/TH electives	3	3	
* Electives		5	9
	17	16	17
Senior			
Advanced Pomology (FRSC 421)	3		
Plant Breeding (CRSC 304)	4		
Senior Project (CRSC 461, 462)	2	2	
Undergraduate Seminar (CRSC 463)			2
General Field Crops (CRSC 230)		4	
Labor Relations and Personnel Management (AM 401)			4
American and California Government (POLS 201)	3		
‡ Growth of American Democracy (HIST 204)		3	
‡ U.S. in World Affairs (HIST 205)			3
† Literature and Philosophy electives.....	3	3	3
† ART/MU, or TH electives			3
* Electives	2	3	
	17	15	15

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

* At least 12 units to be selected with the approval of the adviser from 300-400 series courses.

† To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

‡ HIST 206 plus one additional elective unit may be substituted for HIST 204, 205.

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 dairy curriculum 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 under either option for students to select additional courses in the sciences, business, education, or other areas of their choice to prepare them for advanced degrees in the field, teaching, or the business world of the dairy industry. Recommendations in these various areas will be given by 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
Elements of Dairying (DH 121)	4		
Dairy Feeds and Feeding (DH 101)	2		
Feeding Dairy Cattle (DH 102)		2	
Market Milk (DM 133)			4
Freshman Composition (ENGL 104, 105)	3	3	
Mathematics electives		3	3
General Zoology (ZOO 131)		4	
General Botany (BOT 121)	4		
Health Education (PE 250)			2
Electives and courses to complete major	<u>4</u>	<u>5</u>	<u>7</u>
	17	17	16
Sophomore			
Milk Production (DH 221)	4		
Dairy Foods Evaluation (DM 233)			2
Economics (ECON 201 or 211)		3	
Principles of Speech (SP 200)			3
* Literature elective	3		
* Philosophy elective		3	

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
General Bacteriology (BACT 221)	4		
General Psychology (PSY 202)			3
Literature/Philosophy elective		3	
Computer Science elective		3	
Electives and courses to complete major	<u>3</u>	<u>5</u>	<u>6</u>
	17	17	17

Junior

Dairy Inspection (DM 332)			3
Dairy and Poultry Product Merchandising (DM 202)		3	
General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
Report Writing (ENGL 218)			3
American and California Government (POLS 201)	3		
Electives and courses to complete major	<u>10</u>	<u>9</u>	<u>6</u>
	17	16	16

Senior

Senior Project (DH 461, 462)	2	2	
Undergraduate Seminar (DH 463)			2
Biochemistry (CHEM 328)	4		
* ART, FOR LANGS, MU, or TH elective	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
* Anthropology or Sociology elective			3
Electives and courses to complete major	<u>7</u>	<u>11</u>	<u>8</u>
	16	16	16

HUSBANDRY OPTION

(ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman

DH 142 Dairy Cattle Selection	(2)	DH 323 Breeds, Pedigrees and Man-	
SS 121 Soils	(4)	agement	(4)

Sophomore

DH 222 Commercial Dairy Herd Man-		BIO 303 Genetics	(3)
agement	(4)	AM 321 Farm Records	(4)

VS 123 Anatomy and Physiology	(3)		
VS 302 Animal Hygiene	(3)		

Junior

DH 301 Advanced Dairy Cattle Feed-			
ing	(2)		

Senior	
DH 422 Breed 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)		
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Sophomore

DM 334 Cheese Making	(4)		
DM 336 Butter and Dairy Spreads	(4)		

BACT 322 Dairy Bacteriology	(4)		
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Junior

DM 331 Condensed and Dry Milk	(4)
Management elective	(3)

DM 326 Fermented Dairy Foods	(3)
ACTG 131-2 Basic Accounting	(6)

Senior

DM 431 Dairy Plant Management	(4)
DM 433 Dairy Equipment and Sys-	
tems	(4)

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

FOOD SCIENCE DEPARTMENT

Department Head, Robert D. Vance

Thomas M. Lukes
O. Robert Noyes

F. Raymond Steele
Mary Y. Wang

Rudy A. Wooten

The Food Science curriculum 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.

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.

Employment opportunities for graduates are excellent.

CURRICULUM IN FOOD SCIENCE

	F	W	S
Freshman			
Introductory Food Engineering (FDSC 122)			4
Processed Food Inspection (FDSC 150)		3	
Meats (FDSC 210 or 209)	3		
Nutrition (HE 210)		3	
Freshman Composition (ENGL 104, 105)	3	3	
American and California Government (POLS 201)			3
Algebra (MATH 113)	3		
Mathematics elective		3	
†† Physical Education activity	1		1
General Chemistry (CHEM 121, 122)		4	4
Introductory Physics (PHYS 104)			4
Plant Science elective	4		
Library (LIB 101)	1		
	15	16	16
Sophomore			
Unit Processing Operations (FDSC 241, 243, 245)	4	3	3
General Bacteriology (BACT 221)	4		
Survey of Organic Chemistry (CHEM 226)		4	
Principles of Speech (SP 200), or Public Speaking (SP 201)	3		
Biochemistry (CHEM 328)			4
General Psychology (PSY 202)		3	
Growth of American Democracy (HIST 204)	3		
U. S. in World Affairs (HIST 205)		3	
Report Writing (ENGL 218)	3		
Animal Science elective			4
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
* Electives			3
	17	16	17

†† Students may substitute PE 250.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.) Students must have at least 3 courses in Philosophy and Literature with at least one course in each, and at least 3 units of Art, Music or Theatre.

* At least 12 of the elective units must be chosen with adviser's approval.

	F	W	S
Junior			
Food Quality Control (FDSC 321)	3		
Statistical Quality Control (FDSC 332)		3	
Packaging (FDSC 336)	3		
Sanitation and Waste Disposal (FDSC 331)	3		
Sausage and Smoked Meats (FDSC 338)		3	
Wines and Fermented Foods (FDSC 341)			3
Advanced Food Engineering (FDSC 350)			3
Economics (ECON 201/211)	3		
Industrial Relations (MGT 313)		3	
Geography of Hunger (GEOG 320)			3
Business electives		3	3
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3	3	
* Electives	2	2	5
	17	17	17
Senior			
Advanced Food Processing (FDSC 421)	3		
Food Composition Science (FDSC 422)		4	
Food Evaluation (FDSC 425)		3	
Advanced Meats (FDSC 431)			3
Food Processing Management (FDSC 433)			3
Food Microbiology (BACT 421)	4		
Senior Project (FDSC 461, 462)	2	2	
Undergraduate Seminar (FDSC 463)			2
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
* Electives	8	5	5
	17	17	16



† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.) Students must have at least 3 courses in Philosophy and Literature with at least one course in each, and at least 3 units of Art, Music or Theatre.

* At least 12 of the elective units must be chosen with adviser's approval.

NATURAL RESOURCES MANAGEMENT DEPARTMENT

Department Head, Robert F. Wambach

Jack E. Bedwell
 Mark D. Gibson
 Michael T. Hanson
 John H. Harris

Anthony E. Knable
 Walter R. Mark
 Ralph E. Monteen

Norman H. Pillsbury
 James R. Vilkitis
 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 natural resources: water, forage, forests, fish and wildlife, wildlands, and recreational lands.

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 reinforces classroom and laboratory experiences, and enhances opportunities for postgraduate employment. Cal Poly cooperates with employers to maximize pregraduation student employment.

Students are awarded the degree of Bachelor of Science upon completion of the program.

Graduates enter employment with federal agencies such as Forest Service, Park Service, Soil Conservation Service, and Bureau of Land Management; state agencies such as Natural Resources, Parks and Recreation, and Fish and Game; 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, rural recreational enterprises and environmental consulting firms. Qualified graduates are prepared to pursue graduate studies in most universities.

The departmental facilities provide opportunity for development of skills necessary for natural resources management. Field practices utilize special campus sites and nearby public and private resource areas.

CURRICULAR CONCENTRATIONS

Environmental Services

The environmental services concentration prepares students for employment as professionals in the fields of resource planning, environmental impact assessment, 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 employment in forestry. The curriculum provides broad training in wildland and urban forestry as well as watershed and fire management. Extensive field training occurs concurrently with classroom instruction. Students are able to obtain immediate application of forest management principles. Cal Poly is a candidate institution for accreditation through the forest resources management concentration by the Society of American Foresters.

Parks and Outdoor Recreation

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

CURRICULUM IN NATURAL RESOURCES MANAGEMENT

Freshman	F	W	S
Introduction to Parks and Outdoor Recreation (NRM 112)		3	

	F	W	S
Introduction to Fisheries and Wildlife Management (NRM 120)			3
Forest Resources (NRM 130)	3		
General Botany (BOT 121)		4	
Introductory Plant Taxonomy (BOT 123)			4
College Algebra and Trigonometry (MATH 120)	5		
Soils (SS 121)			4
Freshman Composition (ENGL 104, 105)	3	3	
Health Education (PE 250)			2
† Art, Music, or Theatre elective.....		3	
† Sociology or Anthropology elective.....	3		
* Major/support courses	<u>3</u>	<u>4</u>	<u>3</u>
	17	17	16
Sophomore			
Fortran Programming (CSC 101)		2	
Statistical Methods (STAT 211, 212)	3	3	
General Chemistry (CHEM 121, 122)		4	4
College Physics (PHYS 121).....			4
Principles of Speech (SP 200)	3		
Literature elective		3	
General Psychology (PSY 202)	3		
American Democracy and World Affairs (HIST 206)			5
Principles of Economics (ECON 212)	3		
American and California Government (POLS 201)			3
* Major/support courses	<u>5</u>	<u>5</u>	
	17	17	16
Junior			
Natural Resources Policy (NRM 302)	3		
Ecology of Resource Areas (NRM 304)		4	
Advanced Composition (ENGL 304) or Writing for Scientific Journals (ENGL 318)			4
Philosophy elective (PHIL 315, 321, 331, or 333)		3	
† ANT/ECON/ETHS/GEOG/HIST/POLS/PSY/SOC elective	4		
† Literature/Philosophy (upper division) elective	3		
† ART/FOR LANGS/HUM/LIT/PHIL/TH (3 units upper division)		3	3
* Major/support courses	3		6
* Concentration courses.....	<u>3</u>	<u>7</u>	<u>4</u>
	16	17	17
Senior			
Natural Resource Economics (NRM 401).....		3	
Watershed Management (NRM 440)			4
Natural Resources Administration (NRM 406)	4		
Senior Project (NRM 461, 462)	2	2	
Aerial Photogrammetry (AE 345)	3		
* Major/support courses		4	3
* Concentration courses.....	4	4	6
Electives	<u>3</u>	<u>3</u>	<u>3</u>
	16	16	16

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

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

* Courses to be chosen with the approval of the adviser, including 29 units in a field of concentration.

ORNAMENTAL HORTICULTURE DEPARTMENT

Department Head, Ronald D. Regan

Anthony J. Amato	Thomas E. Eltzroth	Daniel E. Lassanske
Dennis L. Beck	Winton Frey	William E. Noble
Patricia H. Breckenridge	Timothy A. Gaskin	Marshall E. Ochylski
Howard C. Brown	Robert L. Gordon	Robert P. Rice
Charlotte Burns	David W. Hannings	Virginia R. Walter
E. Wesley Conner	Ernest R. Houston	Michael D. Zohns
James A. D'Albro	Kenneth E. Kline	

The ornamental horticulture curriculum 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, landscape contracting and maintenance, 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 28,000 square feet of glasshouses, 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
Fundamentals of Ornamental Horticulture (OH 131, 132, 133)	4	4	4
Principles of Landscape Design I (OH 101)	3		
Principles of Landscape Design II (OH 102)		3	
Agricultural Mechanics (AE 121)	2		

	F	W	S
Ornamental Horticulture Construction (OH 126)			2
English Composition (ENGL 104, 105)	3		3
Agricultural Mathematics (MATH 102 or 103) or Algebra (MATH 113 or 114)	3	3	
General Botany (BOT 121, 123)		4	4
Physical Education electives	2		
* Electives and courses to complete major		<u>2</u>	<u>3</u>
	17	16	16
Sophomore			
Plant Materials (OH 231, 232, 233)	4	4	4
Soils (SS 121)	4		
Agricultural Entomology (ENT 220) or Applied Insect Pest Manage- ment (CRSC 311)			4
Fertilizers (SS 221)		4	
Principles of Speech (SP 200)		3	
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)			3
General Psychology (PSY 202)	3		
Report or Technical Writing (ENGL 218 or 219)	3		
* Electives and courses to complete major	<u>3</u>	<u>5</u>	<u>6</u>
	17	16	17
Junior			
Diseases and Pests of Ornamental Plants (OH 327)			4
Ornamental and Forest Pathology (BOT 324)	4		
Basic Accounting (Actg 131, 132)	3	3	
American and California Government (POLS 201)			3
General Chemistry (CHEM 121, 122)	4	4	
Business Law Survey (BUS 201)		3	
Approved Science electives		3	4
† Foreign Languages elective	3		
* Electives and courses to complete major	<u>3</u>	<u>4</u>	<u>5</u>
	17	17	16
Senior			
Senior Project (OH 461, 462)	2	2	
Undergraduate Seminar (OH 463)			2
Agricultural Labor Relations and Personnel Management (AM 401) ..	4		
Survey of Organic Chemistry (CHEM 226)	4		
† Literature elective	3		
† Philosophy elective		3	
† Literature or Philosophy elective (300-400 level)			3
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
† Anthropology or Sociology elective (300-400 level)		3	
Fruit/Vegetable/Crop Science elective (200-400 level)		4	
Introductory Plant Physiology (BOT 322)	4		
* Electives and courses to complete major		<u>1</u>	<u>8</u>
	17	16	16

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

* Of the total elective units 26-29 must be chosen in a field of concentration with approval of the adviser; with a minimum of 17 units of 300-400 level. In accordance with General Education-Breadth requirements 5-6 units must be selected from ART 111, 121, 231, 232 or 233.

† To be chosen in accordance with the General Education-Breadth requirements. (See adviser or department office.)

POULTRY DEPARTMENT

Department Head, Robert A. Voitle
Roland Pautz

The function of the Poultry Industry major is to prepare 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, turkeys, 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 turkeys. 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
Poultry Industry Development (PI 121)	4		
Replacement Programs and Broiler Production (PI 122)		4	
Poultry Feeding and Nutrition (PI 123)			4
Dairy Feeds and Feeding (DH 101)	2		
Agricultural Engineering electives		2	2
Freshman Composition (ENGL 104, 105)	3	3	
Mathematics electives	3	3	
Health Education (PE 250)	2		
General Zoology (ZOO 131)		4	
General Botany (BOT 121)			4
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives			6
Electives	<u>3</u>	<u>1</u>	<u> </u>
	17	17	16
Sophomore			
Poultry Selection and Egg Production (PI 221)	3		
Poultry Production Processing and Marketing (PI 222)		3	
Poultry Incubation (PI 223)			2
Poultry Plant Design and Equipment (PI 233)			2
Agricultural Engineering or Welding elective	2		
Poultry Anatomy and Physiology (PI 231)	2		
Report Writing (ENGL 218)			3
Principles of Speech (SP 200)		3	
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective		3	
Computer Science elective			3

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
General Bacteriology (BACT 221)	4		
Genetics (BIO 303)		3	
General Psychology (PSY 202)		3	
* Business Management course			3
† ART, FOR LANGS, MU, or TH elective			3
Electives	3	2	
	17	17	16
Junior			
Applied Poultry Breeding (PI 321)	3		
Poultry Business Organization (PI 322)		4	
Poultry Diseases and Hygiene (PI 323)			3
Dairy and Poultry Products Merchandising (DM 202)		3	
Agricultural Engineering elective			3
Farm Records (AM 321) or Principles of Accounting (ACTG 221)	4		
Agricultural Economics (AM 212) or Principles of Economics (ECON 212)		3	
† Literature and Philosophy electives.....	3		3
American and California Government (POLS 201)		3	
Growth of American Democracy (HIST 204)			3
General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
Electives	3		
	17	17	16
Senior			
Advanced Poultry Enterprise Supervision (PI 422)		3	
Turkey Industry (PI 421)	3		
Senior Project (PI 461, 462)	2	2	
Undergraduate Seminar (PI 463)			2
Agricultural Labor Relations and Personnel Management (AM 401) ..	4		
Animal Nutrition (ASCI 402)			4
U.S. in World Affairs (HIST 205)			3
Biochemistry (CHEM 328)		4	
Computer Science elective.....			2
† Management elective	3		
Electives	4	7	5
	16	16	16

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

* To be selected from BUS 201, MGT 118, MGT 311.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

‡ 200-400 series courses in AM, BUS, or MGT.

SOIL SCIENCE DEPARTMENT

Department Head, Curtis Dean Piper

Gaston Amedee
Arnold M. Dean
Delmar D. Dingus
Brent G. Hallock

Royce L. Lambert
David B. Lesczynski
Thomas A. Ruehr

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

The curriculum of the Soil Science Department prepares graduates for employment in professional positions encompassing the various fields of agriculture, such as soil conservationists, land appraisers, fertilizer distributors, farm advisers, farm managers, farm operators or agriculture teachers, and highly specialized positions such as those of soil surveyors, laboratory technicians, soil specialists, and graduate studies.

Facilities of the department have been developed to provide laboratory, glasshouse space, land and equipment to emphasize the utilization of classroom knowledge in a practical work situation. The use of demonstration plots, agriculture internships, and the application of accepted cultural practices on the campus farm are among the methods utilized to integrate the classroom with working experiences and careers.

Students who elect to major in soil science develop a broad background in the basic sciences and are presented with ample opportunities to apply the 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 important relationship between man and the soil in regard to meeting society's needs for food and fiber.

CURRICULUM IN SOIL SCIENCE

	F	W	S
Freshman			
Orientation in Soil Science (SS 100)	1		
Soils (SS 121)	4		
Soil Management (SS 122)		4	
Ag Support electives (from approved list)			7
* Crop Science elective	4		
General Chemistry (CHEM 127, 128)		4	4
Freshman Composition (ENGL 104, 105) or English Composition (ENGL 114, 115)	3-4	3-4	
* Mathematics courses (from approved list)		3	3
General Botany (BOT 121)	4		
Health Education (PE 250)		2	
Elective	—	—	<u>2</u>
	16-17	16-17	16
Sophomore			
Soil Conservation (SS 202)		3	
Fertilizers (SS 221)	4		
Ag Support electives (from approved list)	4	3	
Soil Materials (SS 223)			4
Irrigation (AE 340)			4
General Chemistry (CHEM 129)	4		
Survey of Organic Chemistry (CHEM 226)		4	
Biochemistry (CHEM 328)			4
Economics (ECON 201 or 211)	3		
American and California Government (POLS 201)		3	
Growth of American Democracy (HIST 204)			3
Physics (PHYS 104 or 121)		4	
Electives	<u>1</u>	—	<u>2</u>
	16	17	17

* Selected with approval of adviser.

	F	W	S
Junior			
Soil Classification (SS 321)	4		
Soil Fertility (SS 322)		3	
Land Use Planning (SS 433)			3
Farm Records (AM 321) or Basic Accounting (ACTG 131)	4		
* AM/BUS/MGT elective			3
† BOT/BIO/BACT elective (300-400 level)		4	
General Bacteriology (BACT 221)	4		
General Entomology (ENT 326) or Insect Control (CRSC 311)	4		
U.S. in World Affairs (HIST 205)		3	
Principles of Speech (SP 200)		3	
† Literature elective		3	
Experimental Techniques and Analysis (CRSC 411)			4
† Written or Oral Communication elective.....			3
Science or Mathematics elective (from approved list)			4
Electives		0-2	
	16	16-18	17
Senior			
Soil Microbiology (SS 422)		3	
Soil Chemistry (SS 423).....			4
Soil Physics (SS 432)	4		
Senior Project (SS 461, 462)	2	2	
Undergraduate Seminar (SS 463)			2
PSY or SOC elective		3	
* Philosophy elective			3
† BACT/BIO/BOT elective (300-400 level)		4	
** ART/FOR LANGS/HUM/LIT/MU/PHIL/TH (3 units from LIT/PHIL) electives.....	3	3	
* AM/BUS/MGT elective (300-400 level)	3		
† ART/FOR LANGS/MU/TH electives		3	3
Electives	4		3
	16	18	15

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



* Selected with approval of adviser.

† To be selected in accordance with General Education-Breadth requirements and with approval of adviser.

ANIMAL AND VETERINARY SCIENCE DEPARTMENT

Department Head, Richard F. Johnson

Veterinary science courses are offered for students enrolled in the animal science and dairy science majors. Veterinary science courses are open for elective credit to all students who have completed the required prerequisites. Consultative services and specialized courses are offered to students pursuing either animal health technician or pre-veterinary training as a complement to their major field of study. Veterinary service is provided for the University's animal resources, meat inspection, and preventive medicine related to the potentials for zoonotic disease control. (Please see page 83 for additional information.)



School of Architecture and Environmental Design

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SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

George J. Hasslein, FAIA, Dean
Kenneth E. Schwartz, FAIA, 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, 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 human physical environment. These programs endeavor to give the student a set of social values, a technical background, and a 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 instructors. 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.

Common Coursework

The first two years of all five programs contain much common material and develop basic skills and background. Students who are unsure of their degree objective should consult with their advisors in order to maintain programs of study which will keep their options flexible.

The prospective transfer student can best prepare for architecture, architectural engineering or construction by taking equivalent Mathematics, Physics and other General Education courses. Wherever possible, the student should prepare including 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
John W. Edmisten
Jacob Feldman

Raymond J. Hauser
Carl C. Hsieh
Hans L. Mager

William R. Phillips
Satwant S. Rihal

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 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.

Freshman	F	W	S
Intro to Architecture and Environmental Design (EDES 101)	2		
Descriptive Drawing (EDES 110)	1		
Introduction to Drawing and Perspective (EDES 111)		3	
Basic Graphics (EDES 112)			3
Materials of Construction (ARCH 106)			3
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Physics (PHYS 131, 132)		4	4
Engineering Surveying (AE 237)	2		
Freshman Composition (ENGL 104, 105)	3	3	
General Psychology (PSY 202)	3		
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Physical Education activity		<u>1</u>	
	18	18	17
Sophomore			
Environmental Design Fundamentals (EDES 201, 202)	3	3	
Architectural Design (ARCH 203)			3
Digital Computer Applications (EDES 250)			2
Architectural Practice (ARCH 231, 232)		3	3
Structures (ARCE 221, 222, 223)	3	3	3
Building Structural Systems (ARCE 225)			3
General Physics (PHYS 133)	4		
Survey of Economics (ECON 201)	3		
Analytic Geometry and Calculus (MATH 241)	4		
Principles of Speech (SP 200)			3
Differential Equations (MATH 242)		4	
* English elective (300 level)		3	
Physical Education activity, or Health Education (PE 250)		<u>1-2</u>	<u>0-1</u>
	17	17-18	17-18

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

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	F	W	S
Junior			
Stress Analysis Laboratory (ARCE 301)	1		
Structural Analysis (ARCE 302)	3		
Steel Design (ARCE 303)		3	
Timber Design (ARCE 304)			3
Matrix Analysis of Structures (ARCE 306)		3	
Structures Laboratory (ARCE 361, 362, 363)	3	3	3
Soil Mechanics (ARCE 421)			3
Electrical Circuit Theory (EE 201)		3	
Numerical Linear Analysis (CSC 331)	3		
Physical Geology (GEOL 201)		3	
* Literature elective	3		
* Biology elective with laboratory			3
* Philosophy elective (300-400 level)			3
General Chemistry (CHEM 124)	4		
Introduction to Urbanization (CRP 211)		3	
History of Architecture (ARCH 317, 318, or 319)			3
	17	18	18
Senior			
Seismic Analysis (ARCE 483)		3	
Concrete Testing Laboratory (ARCE 415)	1		
Foundation Design (ARCE 422)	3		
Economic Analysis for Engineers (ARCE 433)			2
Structural Design (ARCE 444, 445, 446)	4	4	4
Design Projects (ARCE 451, 452, 453)	3	3	3
Seismic Laboratory (ARCE 481)		1	
Structural Models Laboratory (ARCE 482)			1
Approved technical elective		6	3
** General Education Electives		3	3
* Philosophy Elective (300-400 level)	3		
Thermodynamics (ME 302)	3		
Fluid Mechanics (ME 341)		3	
Electives			2
	17	17	18

- * To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)
- ** Literature/Philosophy (3 units maximum), remainder from Art, Foreign Languages, Humanities, Music or Theatre courses.

ARCHITECTURE DEPARTMENT

Department Head, Raymond W. H. Yeh

Joseph C. Amanzio	Rufus L. Graves, Jr.	Jens G. Pohl
Robert F. Asbury, Jr.	Kenneth L. Haggard	Benjamin K. Polk
Sharad D. Atre	John E. Harrigan, Jr.	Charles W. Quinlan
James R. Bagnall	Patrick D. Hill	Marcel Sedletzky
Ronald E. Batterson	George K. Ikenoyama	Arthur H. Silvers
George M. Baumgarten	Howard F. Itzkowitz	John S. Stuart
David A. Brodie	Donald J. Koberg	Vern Swansen
William H. Brown	John H. Lange	Don E. Swearingen
Arthur J. Chapman	Willard L. McGonagill	Wesley S. Ward
Allan R. Cooper	Sixto E. Moreira	Maurice L. Wilks
Merrill C. Gaines	Paul R. Neel	Carleton M. Winslow
Donald P. Grant	Raymond E. Nordquist	Paul M. Wolff

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, he/she is required to develop an understanding and sensitivity to human needs. 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
Intro to Architecture and Environmental Design (EDES 101)	2		
Descriptive Drawing (EDES 110)	2		
Introduction to Drawing and Perspective (EDES 111)		3	
Basic Graphics (EDES 112)			3
Materials of Construction (ARCH 106)			3
Analytic Geometry and Calculus (MATH 141, 142)	4	4	
General Physics (PHYS 131, 132)		4	4
Freshman Composition (ENGL 104)	3		
Engineering Surveying (AE 237)	2		
Principles of Speech (SP 200)	3		
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
General Psychology (PSY 201)			3
U.S. in World Affairs (HIST 205)			3
Physical Education activity or Health Education (PE 250)	1-2		0-2
	17-18	17	16-17
2nd Year			
Environmental Design Fundamentals (EDES 201, 202)	3	3	
Architectural Design Fundamentals (ARCH 203)			3
* Approved design electives			3

* To be selected with adviser approval.

106 Architecture

	F	W	S
Introduction to Environmental Design Science (ARCH 221)		3	
Principles of Site Analysis (EDES 213) or Introduction to Urban Environment (CRP 211) or Urban Design in Architecture (ARCH 245)			
Human Factors for Environmental Designers (EDES 303)	3		
Introduction to Philosophy (PHIL 101)			3
Digital Computer Applications (EDES 250)	2		
Architectural Practice (ARCH 231, 232)		3	3
Structures (ARCE 221, 222, 223)	3	3	3
Introduction to Urbanization (CRP 212)			3
General Physics (PHYS 137)	4		
Survey of Economics (ECON 201)	3		
Advanced Delineation (ARCH 213)		<u>2</u>	
	18	17	18
3rd Year			
History of Architecture (ARCH 317, 318, 319)	3	3	3
Architectural Practice (ARCH 341, 342, 343)	2	2	2
Architectural Design (ARCH 351, 352, 353)	4	5	5
Structures (ARCE 321, 322, 323)	3	3	3
Stress Analysis Laboratory (ARCE 301)	1		
Building Systems elective.....	3		
Building Support Systems (ARCH 307, 308, 309)		<u>3</u>	<u>3</u>
	16	16	16
4th Year			
* Life Science elective			3
Undergraduate Seminar (ARCH 463)			2
Architectural Practice (ARCH 441, 442, 443)	2	2	2
Architectural Design (ARCH 451, 452, 453)	5	5	5
Approved technical electives		3	3
* Sociology or Anthropology elective		3	
Elementary Probability and Statistics (STAT 211)	3		
* Literature elective	3		
***Electives and General Education-Breadth requirements	<u>3</u>	<u>3</u>	<u>3</u>
	16	16	18
5th Year			
Architectural Design (ARCH 481)	5	5	5
Design Project (ARCH 491, 492, 493)	2	2	2
* Literature, Music, Philosophy electives (300-400 level)	3	3	
** Approved technical electives	3	3	5
***Electives and General Education—Breadth requirements.....	<u>3</u>	<u>3</u>	<u>3</u>
	16	16	15

**CURRICULUM FOR THE MASTER
OF ARCHITECTURE DEGREE**

(See the *Graduate Studies Announcement*)

-
- * To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)
 - ** To be selected with departmental approval.
 - *** Must include 3 units selected from ENGL 105, PHIL 221, 222, SP 215, 301 and 3 units of Art, Foreign Languages. (6 units must be upper division.)

CITY AND REGIONAL PLANNING DEPARTMENT

Department Head, William A. Howard

Francis H. Hendricks
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 is directed to the professional field which guides and designs the communities wherein we live. Inasmuch as the education of the student of planning is associated with that of the architect and the engineer, the program has an additional emphasis on design of the physical environment as well as on the process of planning. Concern with the activities of people and their values is essential.

CURRICULUM IN CITY AND REGIONAL PLANNING

Freshman	F	W	S
Introduction to Architecture and Environmental Design (EDES 101)	2		
Descriptive Drawing (EDES 110).....	1		
Introduction to Drawing & Perspective (EDES 111).....		3	
Basic Graphics (EDES 112)			3
General Biology (BIO 101)		3	
* Life or Physical Science elective	3		
Pre-Calculus Algebra (MATH 118)		4	
Finite Mathematics (MATH 121)			3
Digital Computer Applications (EDES 250)			2
Freshman Composition (ENGL 104, 105).....	3	3	
Principles of Speech (SP 200)			3
Growth of American Democracy (HIST 204).....		3	
U.S. in World Affairs (HIST 205)			3
Principles of Sociology (SOC 201)			3
General Psychology (PSY 202)	3		
Survey of Economics (ECON 201).....	3		
Physical Education activity	2		
	17	16	17
Sophomore			
Environmental Design Fundamentals (EDES 201, 202)	3	3	
Introduction to Urbanization (CRP 211)	3		
Survey Methods (CRP 213)			3
American and California Government (POLS 201)	3		
Introduction to Urban Planning (CRP 212).....		3	
Urban Site Planning (CRP 243)			3
Computer Graphics (CSC 255)	3		
Statistical Inference I, II, (STAT 251, 252)	3	3	
Computer Applications for Planners (CRP 216).....			1
Environmental Analysis for Land Use Planning (CRP 241)		2	
Introduction to Conservation (CONS 311).....	3		
Physical Geology (GEOL 201)		3	
Physical Geography (GEOG 250).....			3
Traditional/Modern Logic (PHIL 221 or 222)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective		3	
* Literature elective			3
Physical Education activity			1
	18	17	17

* To be selected in accordance with the General Education-Breadth requirements.

108 City and Regional Planning

	F	W	S
Junior			
Planning Laboratory (CRP 351, 352, 353)	5	5	5
Urban and Regional Design Laboratory (CRP 347, 348, 349)	3	3	3
Urban Sociology (SOC 313)	3		
Economics elective (ECON 212 or higher)		3	
Life or Physical Science elective	3		
Social Psychology (PSY 401)		3	
Municipal Government (POLS 403)			3
* Approved electives	2	2	2
Electives			3
	<hr/>	<hr/>	<hr/>
	16	16	16
Senior			
Senior Project (CRP 461, 462)		2	2
Environmental and Planning Regulations (CRP 420)	3		
Planning Laboratory (CRP 451, 452, 453)	5	5	5
Philosophy elective (PHIL 315, 331, or 333)	3		
† Literature elective		3	
* Approved electives	6	4	4
† Art, Music or Theatre elective		3	
Electives			3
	<hr/>	<hr/>	<hr/>
	17	17	14

CURRICULUM FOR THE MASTER OF CITY AND REGIONAL PLANNING

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

Courses, or equivalents, to be completed prior to acceptance for graduate study:

STAT 252 Statistical Inference for Management	3
EDES 250 Digital Computer Applications or CSC 101 Fortran Programming	2
ECON 221 Microeconomics or ECON 334 Urban Economics	3
BIO 305 General Ecology or NRM 304 Ecology of Resources	3
SP 200 Principles of Speech	3
POLS 321 American Constitutional Law	3

Core courses:

CRP 420 Environmental and Planning Regulations	3
CRP 501, 502 Foundations of Urban and Regional Planning	4, 4
CRP 510 Contemporary Planning Theory	3
CRP 511 Advanced Planning Theory	3
CRP 513 Survey and Research Methods	3
CRP 515 Graphic Communications	3
CRP 516 Quantitative Methods	3
CRP 520 Feasibility Studies in Planning	3
CRP 530 Planning Administration	3
CPR 548 Philosophy of Urban Design	3
CRP 552, 553 Planning Laboratory	5, 5
CRP 554, 555 Advanced Planning Laboratory	5, 5
CRP 599 Thesis	6

61

Approved specialization (non-CRP courses)

12

Approved electives

9

Total units

82 ‡

* To be selected with adviser approval and to include 9 units of CRP courses.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

‡ A maximum of 10 units may be transferred to apply to electives and/or first-year core courses.

CONSTRUCTION DEPARTMENT

Department Head (Acting), James A. Rodger

Helmut L. Schleicher

Matthias R. Wall

The four-year program in Construction leads to the Bachelor of Science degree which is accredited by 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

	F	W	S
Freshman			
Intro to Architecture and Environmental Design (EDES 101)	2		
Descriptive Drawing (EDES 110)	1		
Introduction to Drawing and Perspective (EDES 111)		3	
Basic Graphics (EDES 112)			3
Materials of Construction (ARCH 106)			3
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Physics (PHYS 131, 132)		4	4
Engineering Surveying (AE 237)	2		
Freshman Composition (ENGL 104, 105)	3	3	
Life Science elective			3
General Psychology (PSY 202)	3		
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Physical Education activity		<u>1</u>	<u>1</u>
	18	18	18
Sophomore			
Environmental Design Fundamentals (EDES 201, 202)	3	3	
Project Drawing (CSTR 233)			3
Architectural Practice (ARCH 231, 232)	3	3	
Structures (ARCE 221, 222, 223)	3	3	3
Introduction to Urban Planning (CRP 212)		3	
General Physics (PHYS 137)	4		
General Chemistry (CHEM 124)			4
Survey of Economics (ECON 201)		3	
Ethics (PHIL 331)		3	
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
Corporate Communication (ENGL 310)			3
Physical Education activity	<u>1</u>		
	17	18	16

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.) A total of 6 units from (*) areas must be 300-400 level.

110 Construction

Junior	F	W	S
Concrete Technology (CSTR 321)			3
Stress Analysis Laboratory (ARCE 301)	1		
Structures (ARCE 321, 322, 323)	3	3	3
Wood and Masonry Construction Practices (CSTR 341)	4		
Concrete and Form Work Construction Practices (CSTR 342)		4	
Steel and Earthwork Construction Practices (CSTR 343)			4
Construction Cost Control (CSTR 331)	3		
Business Law Survey (BUS 201)	3		
Elementary Probability and Statistics (STAT 211)			3
Labor Contract Administration (MGT 316)		4	
Principles of Speech (SP 200)		3	
Digital Computer Applications (EDES 250)			2
Building Support Systems (ARCH 308, 309)	3	3	
	17	17	15



Senior			
Cost Alternatives Evaluation (CSTR 332)		3	
Civil Works Estimating (CSTR 441)	2		
Building Estimating (CSTR 442)		2	
Mechanical Systems Principles (CSTR 443)			2
Heavy Construction (CSTR 451)	5		
Project Controls (CSTR 452)		5	
Project Development (CSTR 453)			5
Senior Project (CSTR 461, 462)	2	2	
Construction Contract Administration (CSTR 411)			3
Survey of Foundation Engineering (ARCE 409)		3	
Physical Geology (GEOL 201)	3		
* Literature electives	3		4
Elective			1
	15	15	14

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

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.) A total of 6 units from (*) areas must be 300-400 level.

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

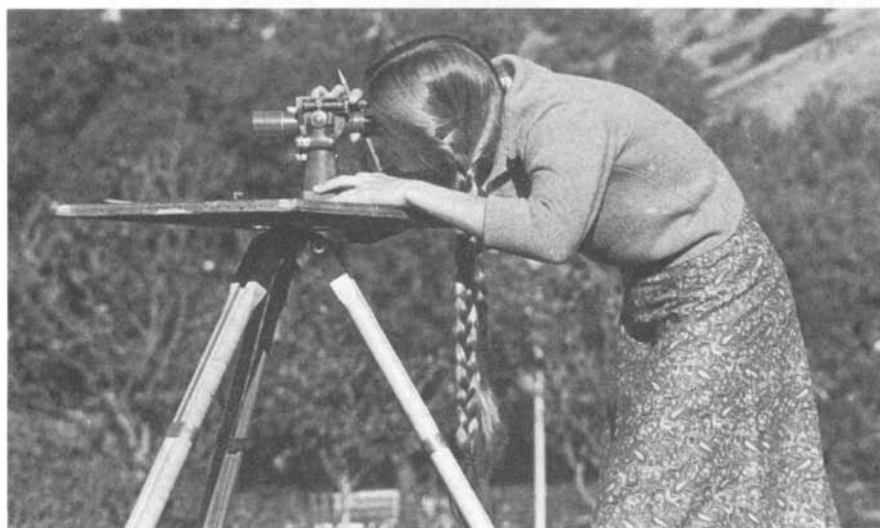
The four-year program for a Bachelor of Science degree in Landscape Architecture is recognized by the California State Board of Landscape Architects and is accredited by the American Society of Landscape Architects. Emphasis is placed on the design and functional organization of open space and the conservation 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.

CURRICULUM IN LANDSCAPE ARCHITECTURE

	F	W	S
Freshman			
Intro to Architecture and Environmental Design (EDES 101)	2		
Graphic Communication for Landscape Architects (LA 110)		3	
Introduction to Landscape Architecture (LA 201)	2		
Basic Graphics (EDES 112)			3
Orientation to Design and Planning in Landscape Architecture (LA 152)		4	
College Algebra and Trigonometry (MATH 120)	5		
Digital Computer Applications (EDES 250)			2
General Botany (BOT 121)		4	
Introduction to Literature (ENGL 207)			3
Principles of Speech (SP 200)		3	
Freshman Composition (ENGL 104, 105)	3	3	
Survey of Economics (ECON 201)	3		
Engineering Surveying (AE 237)			2
American and California Government (POLS 201)	3		
American Democracy and World Affairs (HIST 206)			5
* Physical or Life Science elective			3
Physical Education activity		1	
	18	18	18
Sophomore			
Landscape Architectural Design Fundamentals Laboratory (LA 203) ..			3
Environmental Design Fundamentals (EDES 201, 202)	3	3	
History of Landscape Architecture (LA 311)	3		
Principles of Site Analysis (EDES 213)		3	
Concepts in Environmental Decision Making (LA 321)			3
Environmental Analysis for Land Use Planning (LA/CRP 241)		2	
General Psychology (PSY 202)	3		
Landscape Architecture Construction (LA 231)			3
Native Plant Materials (BOT 238)			3
Structures for Landscape Architects (ARCE 311)		3	
Landscape Plants (OH 237, 238, 239)	3	3	3
Soils (SS 121)			4
Human Cultural Adaptation (ANT 360)	3		
*ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
	18	18	18
Junior			
Professional Practice (LA 441)			2
Landscape Architecture Construction (LA 341, 342, 343)	3	3	3

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.) A total of 6 units from (*) electives must be 300-400 level.

	F	W	S
Landscape Plant Composition (LA 347)	3		
Advanced Landscape Plant Composition (LA 348).....		3	
Design for Landscape Architects (LA 351, 352, 353)	4	4	4
† Approved technical elective		2	
Implementation of Landscape Design (OH 451)	2		
Introduction to Urban Planning (CRP 212).....		3	
Ethics (PHIL 331).....			3
* Social, Political, or Economic, Institutions elective.....	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective			3
	<u>15</u>	<u>15</u>	<u>15</u>



Senior

Professional Practice (LA 442).....	2		
Design for Landscape Architects (LA 451, 452)	5	5	
Advanced Landscape Architecture Design (LA 453)			5
Senior Project (LA 461, 462)	2	2	
Undergraduate Seminar (LA 463).....			2
† Approved technical electives.....	3		3
* Oral and written communication elective	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective		3	
Physical Education activity		1	
Electives		4	5
	<u>15</u>	<u>15</u>	<u>15</u>

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

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.) A total of 6 units from (*) electives must be 300-400 level.

† To be selected with adviser approval.

School of Business

<i>Degree Programs</i>	<i>Page</i>
B.S. Business Administration	116, 118, 122
B.S. Economics	120
M.B.A. Master of Business Administration	114

SCHOOL OF BUSINESS

Robert K. Coe, Dean

John R. Lindvall, 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.

CURRICULUM FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE

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

The objective of the MBA graduate program is to provide for graduates from diverse academic backgrounds a comprehensive and flexible professional foundation for careers of increasing responsibility in the business community and related fields. It features close faculty-student relationships, limited class size, and an integrated study approach to problem solving and decision making. The program is approximately three quarters in length, beginning in September (Fall Quarter) of each year.

Preparatory Courses:

The following undergraduate preparatory courses or equivalent must be completed prior to acceptance for graduate study:

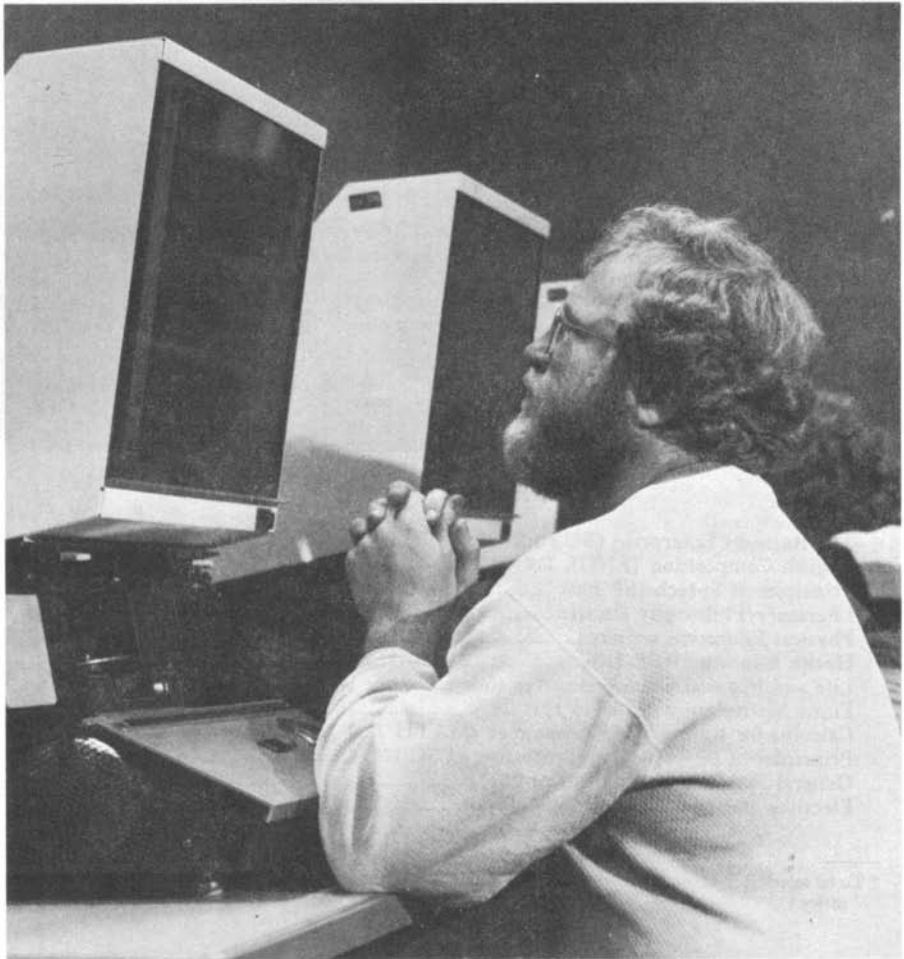
ACTG 221, 222	Principles of Accounting	4, 4
BUS 207	Business Law	4
CSC 120	Principles of Business Data Processing	3
ECON 221	Microeconomics.....	4
ECON 222	Macroeconomics	4
MATH 121	Finite Mathematics	3
MATH 221	Calculus for Business and Economics.....	4
STAT 251	Statistical Inference for Management I	3
STAT 252	Statistical Inference for Management II	3

Graduate Courses:

	F	W	S
GSB 521	Marketing Management	4	
GSB 531	Business Finance	4	
GSB 551	Quantitative Methods in Decision Making	4	
GSB 581	Management and Organizational Theory.....	4	
GSB 511	Accounting for Management Planning and Control.....		4

	F	W	S
GSB 541 Microeconomics		4	
GSB 552 Operations Management and Information Systems.....		4	
GSB 582 Organizational Analysis, Planning and Decision Making		4	
GSB 561 Organizational Behavior.....			4
GSB 571 Business and Society			4
GSB 583 Business Policy Strategy.....			4
† Specialized elective graduate course			4
	16	16	16

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



† Electives: To be selected with approval of the Director of the MBA Program from the following courses: ACTG 50, BUS 500, ECON 500, MGT 500, GSB 512, 522, 532, 533, 542, 562, 563, 572, 584.

ACCOUNTING DEPARTMENT

Department Head, Charles T. Andrews

Lawrence E. Baur, Jr.
Wallace H. Burt
Robert W. Hill

M. Zafar Iqbal
Harold R. Miller
David E. Nutter

Gordon J. Paul
Richard J. Schmidt

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
The Business Enterprise (BUS 101)	4		
English Composition (ENGL 114, 115)	4	4	
Principles of Speech (SP 200)			3
* Literature/Philosophy elective			3
Physical Education activity		1	1
Health Education (PE 250)	2		
Life and Physical Science electives (one each, one with lab)	3	3	3
Finite Mathematics (MATH 121)		3	
Calculus for Business and Economics (MATH 221)			4
Principles of Business Data Processing (CSC 120)			3
General Psychology (PSY 201 or 202)		3	
Electives and courses to complete major	3	3	
	16	17	17

* To be selected in accordance with General Education-Breadth Requirements. (See adviser or department office.)

	F	W	S
Sophomore			
Micro/Macro Economics (ECON 221, 222)	4	4	
Principles of Accounting (ACTG 221, 222)	4	4	
American Democracy and World Affairs (HIST 206)			5
* Social Sciences elective		3	
Traditional Logic/Modern Logic (PHIL 221, 222, or 331)			3
† Art, Music or Theatre elective	3		
Statistical Inference for Management I (STAT 251)	3		
Statistical Inference for Management II (STAT 252)		3	
Business Law (BUS 207)			4
American and California Government (POLS 201)		3	
Written Communication (ENGL 300, 304, or 310)			3
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
	<u>17</u>	<u>17</u>	<u>18</u>
Junior			
Human Resources Management (MGT 314)	4		
Organizational Behavior (MGT 317)			4
Managerial Accounting (ACTG 301)	4		
Financial Management (FPM 342)		4	
Principles of Marketing (MKTG 301)	4		
Organization and Management Theory (MGT 312)	4		
Quantitative Business Analysis and Applications of Data Processing (MGT 321)		4	
Production and Operations Management (MGT 325)			4
Money, Banking and Credit (ECON 337)		4	
‡ Electives and courses to complete major		4	8
	<u>16</u>	<u>16</u>	<u>16</u>
Senior			
† Literature elective	3		
Business Strategy and Policy Seminar (MGT 414)			4
Senior Project (ACTG 461, 462)	2	2	
Governmental and Social Influences on Business (BUS 404)	4		
‡ Electives and courses to complete major	7	14	12
	<u>16</u>	<u>16</u>	<u>16</u>

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, Finance and Property Management, Management, Marketing and other subjects.

* Select one from the following courses: GEOG 315, ANT 201, or SOC 105.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

‡ 27 units of concentration electives must be chosen with the approval of the adviser.

BUSINESS ADMINISTRATION DEPARTMENT

Department Head, Walter W. Perlick

Dan Bertozzi, Jr.
James M. Buxbaum
Paul Kenyon
John R. Lindvall

Michael S. Noble
Eugene L. O'Connor
Rol W. Rider, Jr.

Ronald C. Rogers
Arthur L. Schwartz
Stanley B. Smith

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

The objectives of the Business Administration Department are to provide a level of education that will qualify graduates for entry-level positions in the fields of marketing, finance or real estate. Within the concentrations there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter basic to an occupational goal.

The Department provides service courses to many departments of the University, notably in business law and marketing, in addition to the required core courses in the School of Business.

CURRICULAR CONCENTRATIONS

Finance and Property Management

This concentration is designed as a flexible program for the students wishing to pursue opportunities in either of these fields. Students interested in finance will take specialized coursework in corporate finance, investments and financial markets, while those interested in real estate will take coursework in appraisal, finance, and real estate investments, among others. Successful graduates of either option often assume positions in banking, the investments field, the real estate brokerage field, and other corporate positions.

Marketing Management

Marketing includes all macro and micro activities involved in directing the flow of goods and services from producers through intermediate processors to ultimate consumers. This concentration emphasizes management of organization marketing activities in coordination with all other activities to accomplish organization objectives.

CURRICULUM IN BUSINESS ADMINISTRATION

Freshman	F	W	S
The Business Enterprise (BUS 101)	4		
English Composition (ENGL 114, 115)	4	4	
Principles of Speech (SP 200)			3
* Literature/Philosophy elective			3
Physical Education activity		1	1
Health Education (PE 250)	2		
Life and Physical Science electives (one each, one with lab)	3	3	3
Finite Mathematics (MATH 121)		3	
Calculus for Business and Economics (MATH 221)			4
Principles of Business Data Processing (CSC 120)			3
General Psychology (PSY 201 or 202)		3	
Electives and courses to complete major	3	3	
	16	17	17
Sophomore			
Micro/Macro Economics (ECON 221, 222)	4	4	
Principles of Accounting (ACTG 221, 222)	4	4	

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
American Democracy and World Affairs (HIST 206)			5
* Social Sciences elective		3	
Philosophy elective (PHIL 221, 222, or 331)			3
† Art, Music, or Theatre elective.....	3		
Statistical Inference for Management I (STAT 251)	3		
Statistical Inference for Management II (STAT 252)		3	
Business Law (BUS 207)			4
Written Communication (ENGL 300, 304, or 310).....			3
American and California Government (POLS 201)		3	
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
	17	17	18
Junior			
Human Resources Management (MGT 314)	4		
Organizational Behavior (MGT 317)			4
Managerial Accounting (ACTG 301)	4		
Financial Management (FPM 342)		4	
Principles of Marketing (MKTG 301)	4		
Organization and Management Theory (MGT 312)	4		
Quantitative Business Analysis and Applications of Data Processing (MGT 321)		4	
Production and Operations Management (MGT 325)			4
Money, Banking, and Credit (ECON 337)		4	
‡ Electives and courses to complete major		4	8
	16	16	16
Senior			
† Literature elective	3		
Business Strategy and Policy Seminar (MGT 414)			4
Senior Project (BUS 461, 462)		2	2
Government and Social Influences on Business (BUS 404)	4		
‡ Electives and courses to complete major	9	14	10
	16	16	16

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, Finance and Property Management, Management, Marketing and other subjects.

* Select one from the following courses: GEOG 315, ANT 201, or SOC 105.

‡ 27 units of concentration electives must be chosen with approval of the adviser.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

ECONOMICS DEPARTMENT

Department Head, George M. Eastham

John P. Adams, Jr.
George M. Beardsley
James B. Griffin
Michael W. Johnson

Timothy W. Kersten
Panagiotis Papakyriazis
Dominic Perello
Walter E. Rice

Alden F. Shiers
Howard F. Smith
Fuad H. Tellew
Daniel P. Williamson

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; 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

	F	W	S
Freshman			
Introduction to Economics (ECON 101).....	2		
Freshman Composition (ENGL 104, 105).....	3	3	
Principles of Business Data Processing (CSC 120).....		3	
Principles of Accounting (ACTG 221, 222).....	4	4	
American and California Government (POLS 201).....			3
Health Education (PE 250).....			2
Physical Education activity.....			1
* Life and Physical Science electives (one each, one with lab).....	3	4	3
Introduction to Sociology (SOC 105).....	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives.....		3	3
Literature elective.....			3
Electives.....	2		2
	<u>17</u>	<u>17</u>	<u>17</u>
Sophomore			
Business Law Survey (BUS 201).....			3
Micro/Macro Economics (ECON 221, 222).....	4	4	
† Calculus for Econ/Bus (MATH 221).....	4		
† Math Analysis for Econ/Bus (MATH 222).....		4	
Growth of American Democracy (HIST 204).....	3		
† Statistical Inference for Management I (STAT 251).....		3	
† Statistical Inference for Management II (STAT 252).....			3
U.S. in World Affairs (HIST 205).....		3	
Traditional Logic/Modern Logic (PHIL 221 or 222).....	3		
Principles of Speech (SP 200) or Public Speaking (SP 201).....			3
General Psychology (PSY 202).....			3
Electives.....	3	3	4
	<u>17</u>	<u>17</u>	<u>16</u>
Junior			
Intermediate Micro/Macro Economics (ECON 311, 312, 313).....	4	4	4
Written Communication (ENGL 300, 304, or 310).....	3		
Geography of Resource Utilization (GEOG 315).....			3
Comparative Economic Systems (ECON 304).....		3	
American Economic History (ECON 324).....			3
Money, Banking and Credit (ECON 337).....	4		
‡ Electives and courses to complete major and General Education-Breadth requirements.....	6	9	6
	<u>17</u>	<u>16</u>	<u>16</u>
Senior			
Cost-Benefit Analysis (ECON 410).....	4		
Monetary and Fiscal Policy (ECON 414).....	4		
Development of Economic Analysis (ECON 317).....		3	
Senior Project (ECON 461, 462).....	2	2	
Undergraduate Seminar (ECON 463).....			2
‡ Electives and courses to complete major and General Education-Breadth requirements.....	6	11	14
	<u>16</u>	<u>16</u>	<u>16</u>

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

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† Students in the Quantitative Concentration take MATH 141, 142, 143, and STAT 321, 322 in lieu of the above mentioned courses.

‡ 18 to 20 units to be selected in a field of concentration. For General Education-Breadth select one upper division literature course and one upper division course selected from ART, MU, or PHIL.

MANAGEMENT DEPARTMENT

Department Head, Robert H. McIntire

Melvin W. Aussieker
Allan S. Baillie
Milton Drandell

Geraldine B. Ellerbrock
Melvin E. McMichael
Ernest C. Miller

Rolf E. Rogers
Owen L. Servatius
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, industrial relations, and management information systems); 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 Industrial Relations, International Business Management, Management, and Management Information Systems.

CURRICULAR CONCENTRATIONS

Human Resources Management

The two areas of interest within this concentration relate to labor-management relations and personnel management.

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.

CURRICULUM IN MANAGEMENT

Freshman	F	W	S
The Business Enterprise (BUS 101)	4		
English Composition (ENGL 114, 115)	4	4	
Principles of Speech (SP 200)			3
* Literature/Philosophy elective			3
Physical Education activity		1	1
Health Education (PE 250)	2		
* Life and Physical Science electives (one each, one with lab)	3	3	3

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Finite Mathematics (MATH 121)		3	
Calculus for Business and Economics (MATH 221)			4
Principles of Business Data Processing (CSC 120)			3
General Psychology (PSY 201 or 202)		3	
Electives and courses to complete the major	3	3	
	16	17	17
Sophomore			
Micro/Macro Economics (ECON 221, 222)	4	4	
Principles of Accounting (ACTG 221, 222)	4	4	
American Democracy and World Affairs (HIST 206)			5
* Social Sciences elective		3	
Traditional Logic/Modern Logic (PHIL 221, 222 or 331)			3
† Art, Music, or Theatre elective.....	3		
Statistical Inference for Management I (STAT 251)	3		
Statistical Inference for Management II (STAT 252)		3	
Business Law (BUS 207)			4
Written Communication (ENGL 300, 304 or 310)			3
American and California Government (POLS 201)		3	
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
	17	17	18
Junior			
Human Resources Management (MGT 314)	4		
Organizational Behavior (MGT 317)			4
Managerial Accounting (ACTG 301)	4		
Financial Management (FPM 342)		4	
Principles of Marketing (MKTG 301)	4		
Organization and Management Theory (MGT 312)	4		
Money, Banking and Credit (ECON 337).....		4	
Quantitative Business Analysis and Applications of Data Processing (MGT 321)		4	
Production and Operations Management (MGT 325)			4
‡ Electives and courses to complete major		4	8
	16	16	16
Senior			
† Literature elective	3		
Business Strategy and Policy Seminar (MGT 414).....			4
Senior Project (MGT 461, 462)		2	2
Government and Social Influences on Business (BUS 404)	4		
‡ Electives and courses to complete major	9	14	10
	16	16	16

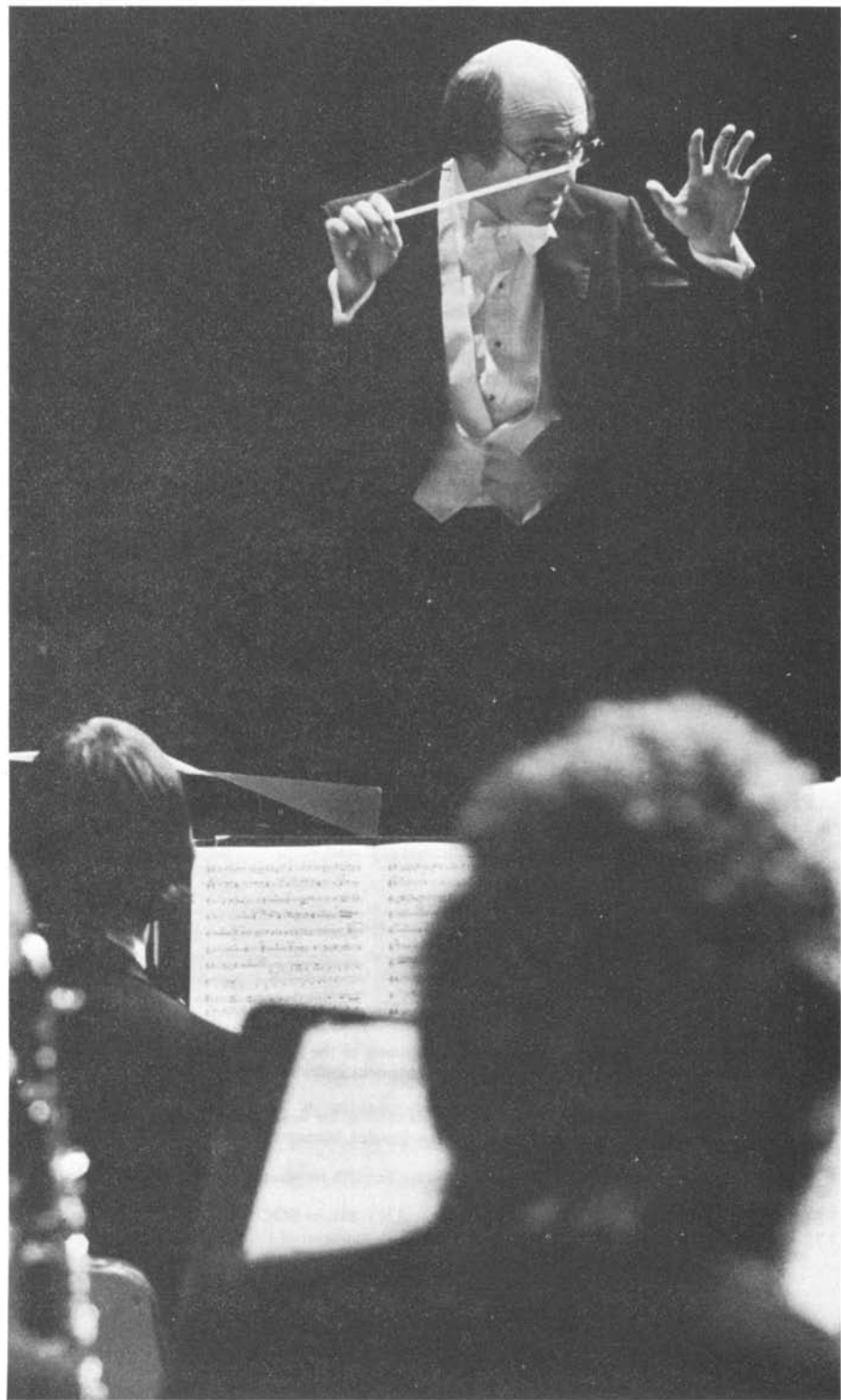
All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

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

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

* Select one from the following courses: GEOG 315, ANT 201, or SOC 105.

‡ 27 units of concentration electives must be chosen with approval of the adviser.



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, Thomas V. Johnston

Robert S. Densham
Bernard W. Dusek
Clarissa Hewitt
Robert Howell
Charles W. Jennings

Eric B. Johnson
Helen P. Kelley
John P. Mendenhall
Christina Orr-Cahall

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, illustration 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. 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 multimedia 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, crafts and design are increasingly relevant to many occupational 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 & DESIGN

Freshman	F	W	S
Fundamentals of Drawing (ART 101)	3		
Design Fundamentals (ART 131, 132, 133)	3	3	3
General Biology (BIO 101)	3		
Basic Photography (ART 221)			3
Basic Accounting (ACTG 131)		3	
English Composition (ENGL 114, 115)		4	4
General Psychology (PSY 202)	3		
* Physical Science elective (one with laboratory)		4	4
Math for General Education (MATH 100)	3		
Physical Education activity	1		1
Electives			2
Courses to complete major		2-3	
		16 16-17	17

* To be selected in accordance with General Education-Breadth requirements from approved departmental list. (See adviser or department office.)

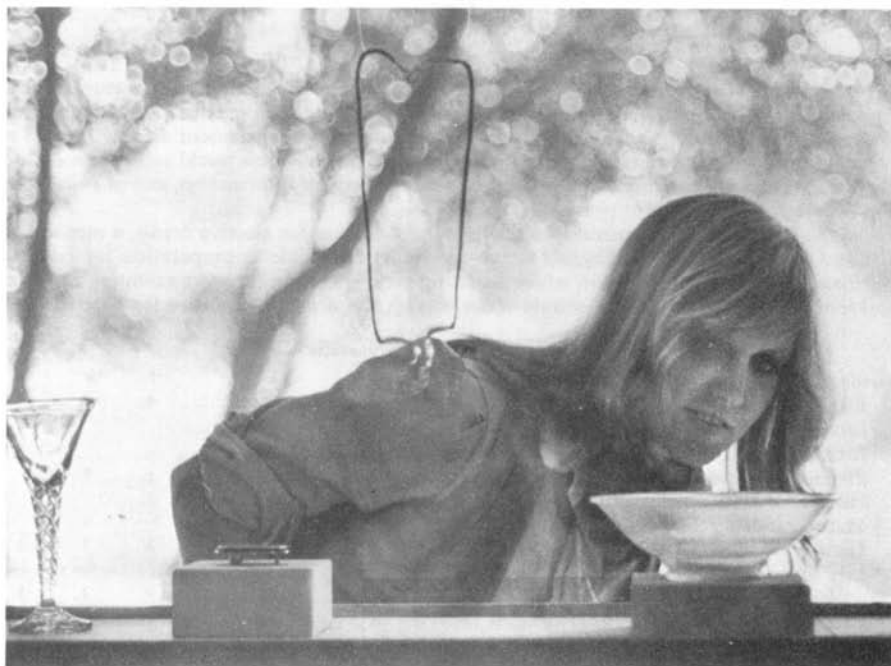
	F	W	S
Sophomore			
35 mm Advanced B/W Photography (ART 224)	3		
35 mm Color Slide Photography (ART 228)			2
Art History (ART 211)	4		
Art History (ART 212 or 213).....		4	
Intermediate Drawing (ART 201)	3		
Marketing Principles (MKTG 204)			4
American and California Government (POLS 201)		3	
Beginning Watercolor (ART 204)		3	
3-Dimensional Design (ART 231)	3		
Functions of Design (ART 232)		3	
Advanced Drawing (ART 301)			3
Survey of Economics (ECON 201)		3	
Principles of Speech (SP 200)			3
Health Education (PE 250).....			2
Courses to complete major.....	3		3
	<u>16</u>	<u>16</u>	<u>17</u>
Junior			
Art History (ART 311 or 313).....	3		
Art History (ART 312)		3	
Exhibition Design/Museum Studies (ART 336)			3
Argumentation (SP 215)	4		
Cultural Anthropology (ANT 201)	3		
American Democracy (HIST 204)			3
Great Books of Western World (ENGL 251, 252 or 253)		4	
* Life Science elective			4
The U.S. in World Affairs (HIST 205)			3
Electives	0-3	2	
Courses to complete major.....	3-6	8	3-4
	<u>16</u>	<u>17</u>	<u>16-17</u>
Senior			
Senior Project (ART 461, 462).....		2	2
Undergraduate Seminar (ART 463)	2		
Professional Practices (ART 460)	2		
History of Music (MU 404, 405 or 406)		3	
* Literature/Philosophy elective (300-400 level).....			4
Theatrical History and Literature (TH 327, 328)	4		
History of Greek, Medieval or Modern Philosophy (PHIL 311, 312, 313 or 314)		3	
* Social, Political, or Economic Institutions elective			3
Electives	3	6	4
Courses to complete major.....	6	3	3
	<u>17</u>	<u>17</u>	<u>16</u>

* To be selected with advisor approval in accordance with General Education-Breadth requirements.

GRAPHIC DESIGN OPTION

(Add Courses Below to Basic Curriculum)

Freshman	
Graphic Art Processes (GRC 127)	(3)
Sophomore	
Copy Preparation (GRC 223)	(3)
Junior	
Graphic Design (ART 331, 332, 333) ..	(9)
Design with Type (GRC 122).....	(5)
Advanced Drawing (ART 302) or Life Drawing (ART 303)	(3)
Illustration (ART 335)	(3)
Senior	
Advanced Graphic Design (ART 431, 432, 433)	(9)
Preseparated Art for Camera (GRC 323).....	(3)



PHOTOGRAPHY OPTION

(Add Courses Below to Basic Curriculum)

Freshman	
History of Photographic Processes (ART 124)	(2)
Sophomore	
Color Photography I, Negative (ART 322).....	(3)
Color Photography II, Positive (ART 323).....	(3)
Junior	
4x5 Camera/Techniques, B/W (ART 325).....	(3)
4x5 Camera/Commercial (ART 326)	(3)
Creative Photography, B/W (ART 422)	(4)
Process Camera (GRC 227)	(5)
Senior	
Special Problems (ART 400).....	(2)
Multi-Media Creative Color Photogra- phy (ART 434)	(4)
Illustration Photography I, B/W (ART 426).....	(3)
Illustration Photography II, Color (ART 427)	(3)

ENGLISH DEPARTMENT

Department Head, Robert McDonnell

Patricia A. Brenner	Miles B. Johnson	James J. Peterson
Edward A. Cairns	David J. Kann	David R. Rollings
Susan Currier	Brent H. Keetch	Mona G. Rosenman
Gordon Curzon	John F. Kerr	Habib Sheik
Max E. Darnielle	Alfred Landwehr	James E. Simmons
Arthur H. Frieztsche	Donald P. Lazere	Douglas B. Smith
John F. Harrington	Robert G. Lint	Charles W. Strong
Robert J. Huot	Nancy Lucas	Gerald J. Sullivan
Gloria Jameson	John H. Mott	William B. Wahl
Starr Jenkins	Michael P. Orth	Isaac N. Walker
		Michael J. Wenzl

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 BA and MA 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
English Composition (ENGL 114, 115)	4	4	
Introduction to Literary Types (ENGL 204)			4
Introduction to Shakespeare (ENGL 233)			3
Physical Education activity	1	1	
Health Education (PE 250)	2		
§ Mathematics for General Education (MATH 100)		3	
History of Western Civilization (HIST 101, 102, 103)	3	3	3
* Life Science and Physical Science electives (one with lab)	3	3	3
Critical Thinking (PHIL 223) or Argumentation (SP 215)			3-4
Electives	<u>1</u>	<u>1</u>	
	14	15	16-17
Sophomore			
Great Books of the Western World (ENGL 251)	3		
Advanced Composition (ENGL 304) or Literary Criticism (ENGL 326)	4		
Creative Writing (ENGL 325)		4	
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
* Life Science and Physical Science electives	3	3	
Cultural Anthropology (ANT 201)			3
General Psychology (PSY 202)			3
Survey of Economics (ECON 201)			3

§ Students preparing for an Elementary Credential should take MATH 327 and 328.

* To be selected in accordance with General Education-Breadth requirements from approved department list.

	F	W	S
Introduction to Linguistics (ENGL 290)		4	
Principles of Speech (SP 200)			3
History of Greek Philosophy (PHIL 311).....	3		
* Electives		2	1
	<u>16</u>	<u>16</u>	<u>16</u>
Junior			
American Literature (ENGL 340 or 341 or 342).....		4	4
Modern English Grammar (ENGL 390)	4		
British Literature (ENGL 330 or 331 or 332)	4		
British Literature (ENGL 333 or 334).....		4	
History of the English Language (ENGL 395)			4
Modern Novel (ENGL 350) or Modern Poetry (ENGL 351) or Modern Drama (ENGL 352)	4		
Great Books of the Western World (ENGL 252)		3	
Oral Interpretation (SP 305)			4
† Art, Music, or Theatre elective.....		3	
Computers and Computing (CSC 110)	3		
* Electives		2	3-4
	<u>15</u>	<u>16</u>	<u>15-16</u>
Senior			
Chaucer (ENGL 430) or Shakespeare (ENGL 431) or Milton (ENGL 432)	4	4	
Significant British Writers (ENGL 439) or Significant American Writ- ers (ENGL 449) or Significant World Writers (ENGL 459)		4	4
English elective (400 level)	4		
English elective (330 or 331 or 332 or 333 or 334 or 340 or 341 or 342)			4
Senior Project (ENGL 461)	2		
* Electives	6	8	6
	<u>16</u>	<u>16</u>	<u>14</u>

CURRICULUM FOR THE MASTER OF ARTS DEGREE

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

Required:	Units
ENGL 502 Introduction to Critical Analysis.....	3
ENGL 503 Contemporary Language Study	3
ENGL 504 Problems in Language	3
ENGL 505 Problems in Composition	3
ENGL 511 Problems in American Literature	6
ENGL 512 Problems in British Literature.....	6
ENGL 590 Graduate Seminar in English.....	3
Additional units in the ENGL 400 and 500 series, selected with advisory committee approval. At least 3 units must be ENGL 504, 511, or 512	9
Elective units which may be in other disciplines, selected with advisory committee approval.....	9
Total Units	45

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

* At least 9 of the elective units must be from the following: HIST 311, 312, 313; SP 215; MU 404*, 405*, 406*; PHIL 312*, 313*, 315*; TH 327*, 328* to meet the General Education-Breadth requirements. An additional 12 units of the electives (one unit upper division) must be selected from ART, LIT, MU, PHIL, or TH. Courses marked with the asterisk (*) may be counted for either requirement.

† To be selected accordance with General Education-Breadth requirements. (See adviser or department office.)

FOREIGN LANGUAGES DEPARTMENT

Department Head, Verlan H. Stahl

Odile Clause

Bianca Rosenthal

Claudio Y. Silva

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 Foreign Language 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 thirty 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 coursework specified by the department plus a written departmental examination. 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, 202, 203 Intermediate French	9
FR 221, 222, 223 French Conversation	6
FR 301 Advanced French Composition and Grammar	3
FR 301 Reading in French Literature (repeatable)	9
FR 470 Selected Advanced Topics	3
	30

CURRICULUM FOR GERMAN MINOR

GER 201, 202, 203 Intermediate German	9
GER 221, 222, 223 German Conversation.....	6
GER 301, 302 Reading and Translation Skills.....	8
GER 305 Significant Writers in German and	
GER 470 Selected Advanced Topics	7
	30

Option:

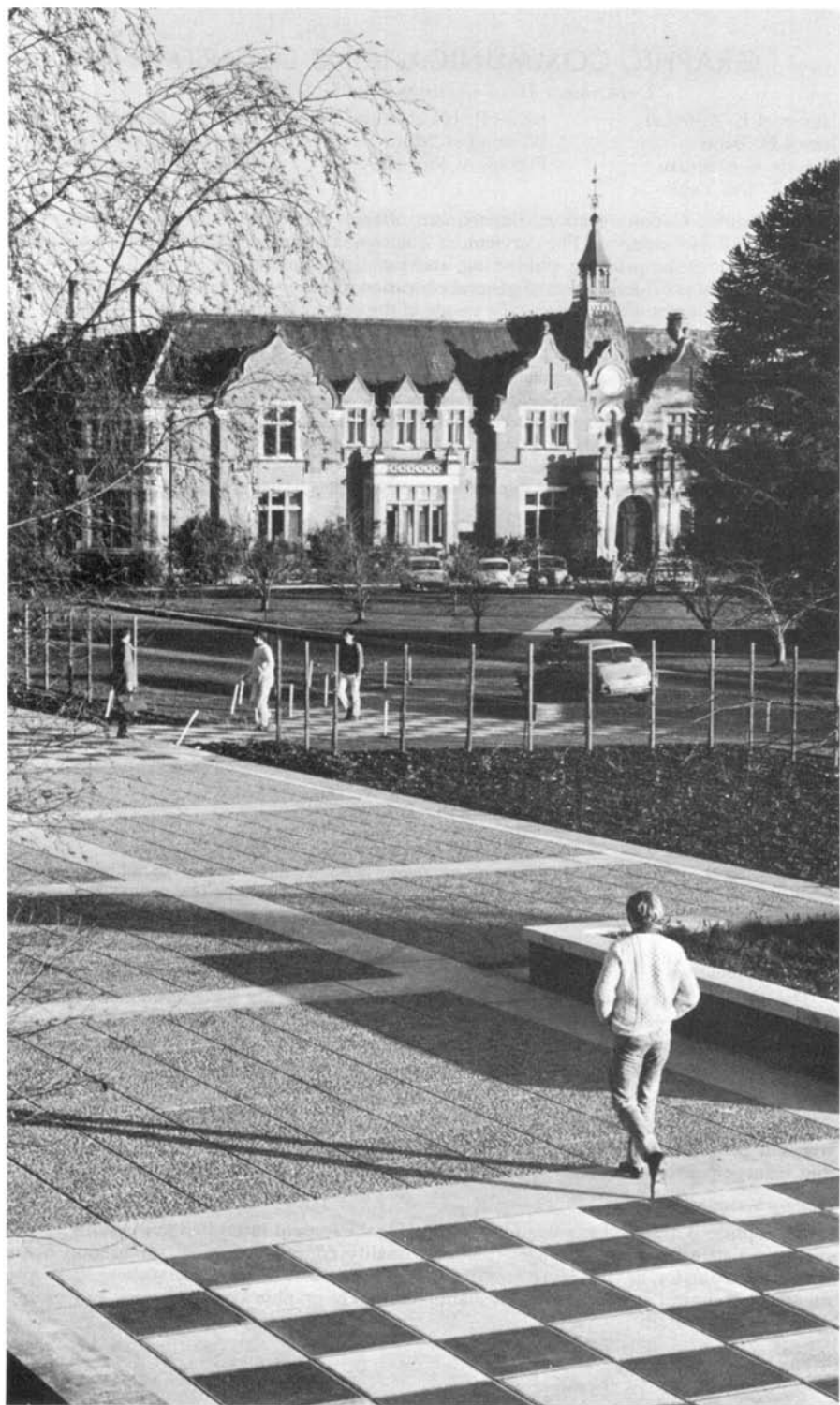
GER 305 Significant Writers in German (4)
Repeatable to 12 units

CURRICULUM FOR SPANISH MINOR

SPAN 201, 202, 203 Intermediate Spanish	9
SPAN 221, 222, 223 Spanish Conversation.....	6
SPAN 301 Review of Spanish Grammar and Composition	3
SPAN 305 Significant Writers in Spanish	
Repeatable to 12 units	12
	30

Option:

SPAN 401 Techniques of Translation (4), and
SPAN 470 Selected Advanced Topics (1-3)



GRAPHIC COMMUNICATIONS DEPARTMENT

Department Head (Acting), Guy H. Thomas, Jr.

Herschel L. Apfelberg
James H. Babb
Eugene F. Coleman
Peter R. Del Vaglio

James R. Hutchinson
W. Stephen Mott
Patrick A. Munroe

Philip K. Ruggles
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 modern 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 printing 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

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

	F	W	S
Freshman			
Introduction to Graphic Communications (GRC 101).....	2		
Substrates and Ink (GRC 111).....			4
Design with Type (GRC 122).....		5	
Binding and Finishing (GRC 123).....			3
Letterpress (GRC 132).....		2	
English Composition (ENGL 114).....	4		
Advanced Composition (ENGL 300 or 304).....			3
* Mathematics elective (MATH 109, 118, or 221).....	3		
* Physical Science electives (one with laboratory).....	4	4	4
Computer Science elective (with department approval).....		3	
General Psychology (PSY 201 or 202).....			3
Physical Education activity.....	1	1	1
Health Education (PE 250).....		2	
	14	17	18
Sophomore			
Introduction to Printing Management (GRC 204).....	3		
Copy Preparation for Reproduction (GRC 223).....		3	
Composing Machines (GRC 224).....	2		
Process Camera (GRC 227).....	5		
Image Assembly and Platemaking (GRC 228).....		4	
Offset Lithographic Presswork (GRC 229).....			5
Relief Printing Specialties (GRC 233).....			3
* Life Science elective.....			3
Art elective (ART 221, 224 or 226).....	3		
Business Law Survey (BUS 201).....			3
American Literature elective (ENGL 340, 341 or 342).....		4	
* Art elective.....	3		
Principles of Economics (ECON 211).....		3	
Courses to complete major (depending on option).....		0-3	0-3
Electives.....		0-3	0-1
	16	17	15-18
Junior			
Composition Systems (GRC 301).....	4		
Estimating (GRC 303).....			3
Printing Equipment Management (GRC 326).....			3
Critical Thinking (PHIL 223).....		3	
Plant Organization and Layout (GRC 333).....			3
Screen Processes (GRC 357).....	2		
Great Books of the Western World (ENGL 251, or 252, or 253).....			3
Growth of American Democracy (HIST 204).....		3	
American and California Government (POLS 201).....	3		
Courses to complete major (depending on option).....	4-8	5-8	3-6
American Literature elective (ENGL 340, 341 or 342).....		4	
Electives.....	0-2	0-1	0-2
	15-17	16-18	17-18
Senior			
Web Printing (GRC 416).....		5	
Printing Management (GRC 421, 422).....	4	3	
Senior Project (GRC 461).....	2		

* To be selected in accordance with General Education-Breadth requirements from approved department list. (See adviser or department office.)

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	F	W	S
The U.S. in World Affairs (HIST 205)			3
Philosophy (PHIL 313, or 331)			3
Principles of Speech (SP 200 or 201)	3		
Courses to complete major (depending on option)	4-8	4-6	4-8
Electives	0-5	3	0-2
	17-18	15-17	12-16

COMPUTER GRAPHIC COMMUNICATIONS OPTION

(Add courses below to basic curriculum)

Sophomore			
CSC 207 Advanced Basic Programming	(3)	CSC 306 Minicomputers	(3)
EL 219 Logic and Switching Circuits	(3)	CSC 309 Microcomputer Architecture Programming	(3)
		IE 214 Production Control	(2)
Junior		Senior	
GRC 302 Technical Basics for Printing	(3)	GRC 429 Advanced Composition Systems	(3)
CSC 221 Computer Principles and Programming	(3)	CSC 409 Application of Microprocessors	(3)
CSC 255 Computer Graphic Applications	(3)	MGT 418 Quantitative Methods and Controls in Business	(3)

DESIGN REPRODUCTION OPTION

(Add courses below to basic curriculum)

Sophomore			
ART 132-3 Design Fundamentals	(6)	ART 331-2-3 Graphic Design	(9)
		Senior	
GRC 323 Pre-Separated Art for Camera	(3)	GRC 439 Advanced Line and Halftone Media	(5)
GRC 335 Line and Halftone Media	(5)	ART 431-2-3 Advanced Graphic Design	(9)

PACKAGING OPTION

(Add courses below to basic curriculum)

Sophomore			
ACTG 131-2 Basic Accounting	(6)	GRC 401 Printing Sales	(4)
		GRC 431 Package Estimating	(3)
Junior		Senior	
GRC 302 Technical Basics for Printing	(3)	GRC 437 Consumer Packaging	(3)
GRC 330 Packaging Substrates	(3)	FDSC 425 Food Evaluation	(3)
FDSC 230 Elements of Food Processing	(4)	MKTG 303 Consumer Behavior	(3)
IT 327 Plastics Technology	(3)		
MKTG 204 Marketing Principles	(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	Senior
GRC 302 Technical Basics for Printing..... (3)	GRC 401 Printing Sales (4)
ACTG 131, 132 Basic Accounting (6)	GRC 408 Newspaper and Publications Management..... (3)
ECON 212 Principles of Economics .. (3)	GRC 411 Estimating, Pricing and Costing..... (4)
CSC 255 Computer Graphics Applications (3)	GRC 423 Printing Management (4)
STAT 211 Elementary Probability and Statistics (3)	Elective with adviser approval..... (2)
MKTG 204 Marketing Principles..... (4)	



HISTORY DEPARTMENT

Department Head, Robert E. Burton

Timothy M. Barnes	Daniel E. Krieger	Robert L. Rosenberg
Lloyd N. Beecher	Edward L. Mayo	John G. Snetsinger
Donald A. Grinde, Jr.	Barton C. Olsen	Shirlene A. Soto
Barbara M. Hallman	Max E. Riedlsperger	Quintard Taylor, Jr.
Donald W. Hensel		Herman C. Voeltz

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 in 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
History of Western Civilization (HIST 101, 102, 103)	3	3	3
English Composition (ENGL 114, 115)		4	4
Physical Education activity	1	1	1
* Life Science and Physical Science electives (one of each, one with lab)	3	3	3
National and California Government (POLS 101, 102)	3	3	
Introduction to International Relations (POLS 105)			3
Mathematics (MATH 100/109) or Computer Science (CSC 110) or Statistics (STAT 211)	3		
Health Education (PE 250)		2	
Historical Craft (HIST 221)	3		
Electives			2
	16	16	16
Sophomore			
United States History (HIST 201, 202, 203)	3	3	3
* Life Science and Physical Science electives	3	3	3
Economics (ECON 211 or 201)	3		
Principles of Sociology (SOC 201, 202)	3	3	
Principles of Speech (SP 200) or Public Speaking (SP 201)		3	
Critical Thinking (Phil 223) or Argumentation (Sp 215)			3
Cultural Anthropology (ANT 201)			3
General Psychology (PSY 201 or 202)	3		
World Prehistory (ANT 202)		3	
* Art, Music or Theatre elective (from approved department list.)			3
	15	15	15

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Junior			
Historiography (HIST 301)	3		
U.S. In World Affairs (HIST 205)			3
U.S. History at 300-400 level.....	3	6	3
* Literature/Philosophy electives (one of each from approved department list).....	3	3	3
* Art/Literature/Philosophy/Foreign Languages elective (from approved department list)	3	3	
** Electives	4	4	7
	<u>16</u>	<u>16</u>	<u>16</u>
Senior			
Senior Project (HIST 460)	2		
European History at 300-400 level		3	3
History at 300-400 level	6	3	6
ANT/ECON/GEOG/POLS/PSY/SOCS/(300-400) electives.....		3	3
** Electives	7	6	3
	<u>15</u>	<u>15</u>	<u>15</u>

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



* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

** At least 16 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

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, Photojournalism, or Public Relations.

No more than 50 credits of the 198 applied toward the degree may be in journalism or related communications courses. 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, 201, 203, or ART 221.

All journalism majors are expected to serve as staff members of departmental communications media, including *Mustang Daily*, the student newspaper; or KCPR, the FM-stereo radio station. 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.

Photojournalism

Prepares students to work as reporter-photographers for newspapers, magazines, and television. Emphasizes the acquisition of knowledge and skills in color as well as black and white photography.

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 †	F	W	S
Journalism in Society (JOUR 118)	3		
English Composition (ENGL 114, 115)	4	4	

† Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

	F	W	S
Introduction to Human Relations in Business (MGT 118)			3
Mathematics (MATH 100 or 102)		3	
Life Science elective	3		
Life Science and Physical Science electives (one with lab)		3	3
Reporting I (JOUR 203)			3
Introduction to Sociology (SOC 105)			3
Health Education (PE 250)	2		
*§ Electives and courses to complete major	<u>5</u>	<u>6</u>	<u>4</u>
	17	16	16

Sophomore

Journalism History (JOUR 201)	3		
Basic Photography (ART 221)		3	
Introduction to Philosophy (PHIL 102)			3
Broadcast News I (JOUR 333)			3
Reporting II (JOUR 304)		3	
Physical science elective	3		
Life science elective			3
Survey of Economics (ECON 201)	3		
American and California Government (POLS 201)	3		
American Democracy and World Affairs (HIST 206)		5	
General Psychology (PSY 202)			3
Principles of Speech (SP 200) or Public Speaking (SP 201)			3
*§ Electives and courses to complete major	<u>5</u>	<u>6</u>	<u>3</u>
	17	17	18

Junior

Public Relations (JOUR 312)	3		
Humanities or Foreign Languages elective		4	
American Political Processes (POLS 302)			3
American Literature (ENGL 340, 341, or 342)	4		
Advanced Composition—Nonfiction (ENGL 304)	4		
Geography of Resource Utilization (GEOG 315)	3		
History of Music (MU 404, 405, or 406)		3	
Technology in the 20th Century (ENGR 301)		3	
Contemporary Philosophy (PHIL 315), Ethics (PHIL 331), Political Philosophy (PHIL 333) or Social Ethics (PHIL 335)			3
Urban Sociology (SOC 313)			3
Rhetoric: Classical Period to Renaissance (SP 317) or Rhetoric: Renais- sance to the Present (SP 318)		3	
*§ Electives and courses to complete major	<u>3</u>	<u>5</u>	<u>9</u>
	17	18	18

Senior

Municipal Government (POLS 403)	3		
Senior Project (JOUR 460)	3		
Media Internship (JOUR 444)	4		
Law for Journalists (JOUR 302)		3	
*§ Electives and courses to complete major	<u>3</u>	<u>13</u>	<u>15</u>
	13	16	15

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

* 9 elective units must be chosen from the following courses: ENGL 251, 252; HIST 101, 102, 103; MU 204, 205; SP 215; PHIL 311, 312, 313, and 4 additional units must be chosen from ANT 201, 341, 360; HIST 303; POLS 306, 310, 312, 380.

§ 19–29 of the elective units must be taken in a field of concentration.

MUSIC DEPARTMENT

Department Head, Bessie R. Swanson

James C. Dearing
William V. Johnson

Ronald V. Ratcliffe
John Russell

Clifton E. Swanson
Graydon 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 Theory I.....	3
MU 203 Theory II	3
MU 102 Sight-Singing and Ear-Training, or	
MU 103 Rhythm Skills	1
MU 204 Music Appreciation	3
One year of vocal or instrumental study.....	3
Upper Division Electives	15
Chosen from upper division Music courses (or, in some cases, specific courses offered by other departments).	

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

PHILOSOPHY DEPARTMENT

Department Head, Kendrick W. Walker

Arthur C. W. Bethel
Stanislaus J. Dundon
Laurence D. Houlgate

Russell A. Lascola
Frederick J. O'Toole
Judy D. Saltzman

Talmage E. Scriven
M. Dolores Sweet

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 24 units (12 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.

	<i>Units</i>
Lower Division Courses	6
PHIL 101 Introduction to Philosophy	3
PHIL 221 Traditional Logic	
or	
PHIL 222 Modern Logic	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 Medieval Philosophy	3
PHIL 307 Philosophy of Religion	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

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

POLITICAL SCIENCE DEPARTMENT

Department Head, Earl D. Huff

William M. Alexander
George G. Clucas
Randal L. Cruikshanks
John H. Culver

David L. George
Reginald H. Gooden, Jr.
Richard B. Kranzdorf
Carl E. Lutrin

Carroll R. McKibbin
Allen K. Settle
John C. Syer
Joseph N. Weatherby

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 twenty-seven units of coursework 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, Industrial Relations, International Trade and Development, Management, and Management Information Systems.

CURRICULUM IN POLITICAL SCIENCE

	F	W	S
Freshman			
English Composition (ENGL 114, 115)	4	4	
Introduction to Political Science (POLS 100)	3		
National and California Government (POLS 101, 102)	3	3	
Introduction to International Relations (POLS 105)			3
* Art, Music or Theatre elective (from approved department list)	3		
History of Western Civilization (HIST 102, 103)		3	3
U.S. in World Affairs (HIST 205)			3
Elementary Probability and Statistics (STAT 211)		3	
Critical Thinking (PHIL 223) or Argumentation (SP 215)			3
Health Education (PE 250)			2
† Electives and courses to complete concentration	<u>2</u>	<u>2</u>	<u>1</u>
	15	15	15
Sophomore			
Principles of Speech (SP 200)	3		
Principles of Economics (ECON 211, 212)		3	3
General Psychology (PSY 201 or 202)	3		
Comparative Politics (POLS 202)	3		
Basic Concepts of Political Thought (POLS 204)			3
Judicial Process (POLS 206)			3
United States History (HIST 202, 203)		3	3
* Life Science and Physical Science electives (one each, one with lab) ..	6	6	3
† Electives and courses to complete concentration	<u>1</u>	<u>4</u>	<u>1</u>
	16	16	16
Junior			
Political Analysis (POLS 305)		5	
Public Administration (POLS 314)	3		
Political Science at 300-400 level	6	3	6
Political Geography (GEOG 305)		3	
* Literature/Philosophy electives (one each from approved department list)	3	3	3
* Art/Literature/Philosophy/Foreign Languages electives	3		3
† Electives and courses to complete concentration	<u>1</u>	<u>2</u>	<u>4</u>
	16	16	16
Senior			
Senior Project (POLS 461, 462)	2	2	
Political Science at 300-400 level	3	3	6
† Electives and courses to complete concentration	<u>10</u>	<u>10</u>	<u>9</u>
	15	15	15

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

* To be selected in accordance with General Education-Breadth requirements, 12 units must be at 300-400 level. (See adviser or department office.)

† 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, Robert L. Hoover

James W. Coleman	Mahmud S. Hariri	Leo W. Pinar II
Barbara E. Cook	Harold R. Kerbo	Richard A. Shaffer
Warren W. DeLey	Patrick C. McKim	George J. Suchand
Donald R. Floyd	John A. McKinstry	Calvin H. Wilvert
Anne C. Fowler	Michael J. O'Leary	

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 the 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 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.

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: Administration, Pre-Law, International Affairs or Urban Studies (Political Science Department); Industrial Relations, Management, or International Trade and Development (School of Business).

CURRICULUM IN SOCIAL SCIENCES

	F	W	S
Freshman			
English Composition (ENGL 114, 115)	4	4	
American and California Government (POLS 201)	3		
Introduction to International Relations (POLS 105)		3	
United States History (HIST 201, 203, 205)	3	3	3
Human Geography (GEOG 150)	3		
Physical Education activity		1	
Health Education (PE 250)			2
Math elective			3
Art, Music or Theatre elective (from approved department list)	3		
Man's Impact on the Earth (GEOG 215)			3
* Electives and courses to complete major		<u>6</u>	<u>6</u>
	16	17	17
Sophomore			
Principles of Sociology (SOC 201, 202, 203)	3	3	3
Cultural Anthropology (ANT 201, 202, 203)	3	3	3
Argumentation (SP 215)			3
General Psychology (PSY 202)		3	
Life Science elective	3		
Physical Science elective			3
Economics elective		3	
Art/Literature/Philosophy/Foreign Language elective (from approved department list)	3		
* Electives and courses to complete major	<u>5</u>	<u>5</u>	<u>3</u>
	17	17	15
Junior			
Physical Geography (GEOG 250)		3	
Comparative Government (POLS 202)	3		
Political Science 300-400 level courses		3	
History 300-400 level courses	3		3
Geography 300-400 level courses	3	3	3
* Life Science/Physical Science electives (one with lab)	3	3	3
Art/Literature/Philosophy/Foreign Language/elective (from approved department list)			3
* Electives and courses to complete major	<u>5</u>	<u>5</u>	<u>4</u>
	17	17	16
Senior			
Senior Project (SOCS 461, 462)	2	2	
Undergraduate Seminar (SOCS 463)			2
Anthropology 300-400 level courses	3	3	3
Sociology 300-400 level courses	3	3	3
Social Research Methods (SOC 333)	3		
Literature/Philosophy electives (one each from approved department list)	3	3	3
* Electives and courses to complete major	<u>2</u>	<u>5</u>	<u>5</u>
	16	16	16

See COURSES OF INSTRUCTION sections of this catalog for descriptions of courses in Anthropology, Geography, Social Sciences, Sociology and other subjects.

* 27 of the elective units must be chosen with the approval of the adviser in a field of concentration. In addition 12 units of 300-400 level courses from the following: HIST (6); POLS (3); and ANT, GEOG, or SOC (3).

SPEECH COMMUNICATION DEPARTMENT

Department Head, Harry Sharp, Jr.

Robert L. Andreini
James R. Conway
James R. Emmel
David R. Henry

Michael R. Malkin
Pamela C. Miller
Keith E. Nielsen
James W. Reed

J. Murray Smith
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 an academic major, 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. 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 readers theatre presentations to campus and community audiences.

CURRICULUM IN SPEECH COMMUNICATION

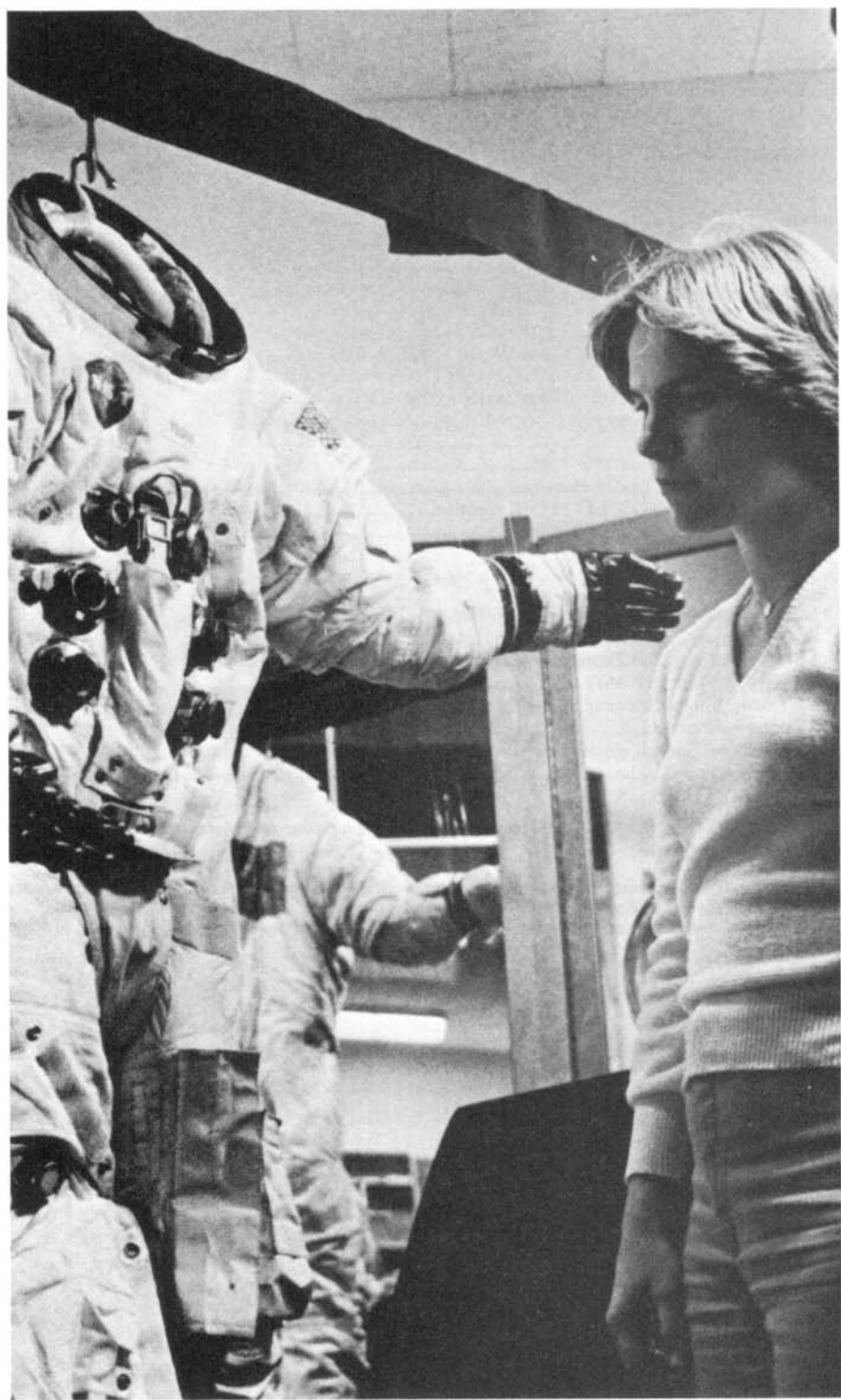
Freshman	F	W	S
Professional Fields of Speech (SP 111)	1		
Public Speaking (SP 201)	3		
Interpersonal Communication (SP 205)			3
Voice and Articulation (SP 206)		3	
Argumentation (SP 215)			3
Forensic Activity (SP 250)		1	
English Composition (ENGL 114)		4	
Elementary Probability and Statistics (STAT 211)	3		
* Life or Physical Science electives (with lab)	3		
Health Education (PE 250)		2	
Physical Education activity			1
* Mathematics, Life Science or Physical Science elective		3	3
General Psychology (PSY 202)	3		
Electives		4	6
	15	15	16
Sophomore			
Essentials of Discussion (SP 217)			4
Introduction to Theatre (TH 220)	3		
Advanced Forensic Activity (SP 350)	2		
Life Science elective		3	
Physical Science elective			3
* Literature or Philosophy elective	3		
* Literature elective			3
* Philosophy elective		3	

* To be selected in accordance with General Education-Breadth requirements from approved departmental list. (See adviser or department office.)

	F	W	S
Phonetics (SP 306)		3	
History of Western Civilization (HIST 101, 102, 103)	3	3	3
Technology elective (AG 301/ENGR 301 or adviser's approval)	3		
** Support courses		<u>3</u>	<u>3</u>
	<u>14</u>	<u>15</u>	<u>16</u>
Junior			
Advanced Composition (ENGL 300)	3		
Persuasion (SP 304)		4	
Oral Interpretation (SP 305)			4
Communication Theory (SP 314)		4	
Rhetoric (SP 317)	4		
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
United States in World Affairs (HIST 205)			3
Cross-Cultural Communication (SP 311)	3		
* Economics elective			3
Rhetorical Criticism (SP 319)		4	
* Art, Music, or Theatre elective	3		
* ART/FOR LANGS/LIT/PHIL elective			3
Electives			<u>3</u>
	<u>16</u>	<u>15</u>	<u>16</u>
Senior			
Organizational Communication (SP 403)		3	
Communication Research (SP 411)	4		
* Social, Political, or Economic Institutions elective	3		
Senior Project (SP 461)		2	
Undergraduate Seminar (SP 463)			2
** Support Courses		4	7
Theatre or Speech electives		4	4
Electives		<u>9</u>	<u>3</u>
		<u>16</u>	<u>16</u>

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Speech, Theatre and other subjects.

- * To be selected in accordance with General Education-Breadth requirements from approved departmental list. (See adviser or department office.) Nine units must be at the 300-400 level.
- ** Seventeen units from courses chosen with approval of student's adviser; minimum of 15 units of 300-400 level.



School of Engineering and Technology

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SCHOOL OF ENGINEERING AND TECHNOLOGY

Robert G. Valpey, Dean
William F. Horton, Associate Dean

The Accreditation Board for Engineering and Technology (formerly the Engineers' Council for Professional Development) 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 in the industrial world 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 per quarter in that major from the first quarter at Cal Poly. This process increases motivation to master the mathematics, basic science, and engineering science which constitute a very important half of each engineering curriculum.

Engineering graduates of Cal Poly are in great demand and find an endless variety of engineering challenges awaiting them. They enter design, manufacturing, research, development, sales, maintenance, operation, etc. in industry, government, consulting firms, and many related activities. Many elect to go directly to graduate school. Increasing numbers find employment outside of the engineering profession in positions where an engineering education is either required or preferred.

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, Metallurgical Engineering.

The School of Engineering and Technology also offers curricula leading to the Bachelor of Science degree in Engineering Technology and Industrial Technology and the Bachelor and Master of Arts in Industrial Arts. Both industrial arts degrees are offered by the Industrial Technology Department.

Engineering Technology is defined by the Accreditation Board for Engineering and Technology (A.B.E.T.) as "that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer."

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.

Industrial Arts 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. In addition the University grants credit for lower division work in accordance with provisions agreed upon in the Engineering Liaison Committee.

Engineering students must select their social sciences and humanities electives with a view to satisfying not only the general education requirement of the California State University and Colleges, but also the humanities and social sciences requirements of the Accreditation Board for Engineering and Technology (A.B.E.T.). (No skills classes are acceptable.)

MASTER OF ENGINEERING

General Characteristics

The Master of Engineering curriculum offers a practice oriented program supported by the School of Engineering and Technology.

The objectives of the program are to provide:

- 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) An excellent base for lifelong individual study in order that the graduate keep technically current in a professional career.

Prerequisites

For admission as a classified graduate student, an applicant normally 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. An applicant who meets these standards but lacks background 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 Engineering
- Computer Engineering
- Electrical Engineering
- Electronic Engineering
- Environmental Engineering
- Industrial Engineering
- Mechanical Engineering

The general 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 in areas outside of specialization, with at least 3 units from 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 (thesis) may be replaced by nine units of coursework with approval of the student's graduate committee.

AERONAUTICAL AND MECHANICAL ENGINEERING DEPARTMENT

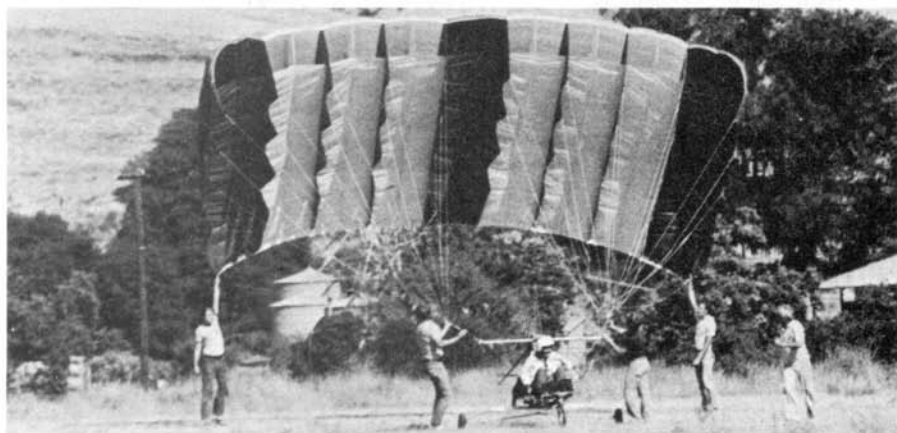
Department Head, Raymond G. Gordon

Robert W. Adamson	Jon A. Hoffmann	Leon F. Osteyee
Alfred E. Andreoli	Michael A. Iannce	William B. Patterson
James G. Andresen	John J. Kane	D. John Price
Edward H. Baker	Roger A. Keech	Doral R. Sandlin
Thomas W. Carpenter	Fredrick B. Malmborg	Ramesh T. Shah
Franklin S. Crane	Ronald S. Mullisen	William B. Stine
Otto C. Davidson	Lawrence H. Nelson	Edward O. Stoffel
Edward R. Garner	John D. Nicolaides	Yuen Cjen Yong
Frank J. Hendel		

CURRICULUM IN AERONAUTICAL ENGINEERING

The Aeronautical Engineering curriculum 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 yet products must nevertheless be designed and manufactured. Thus, an exceptionally wide gamut of engineering abilities is required within the industry and government.

The curriculum in Aeronautical Engineering is accredited by 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 has two design rooms and a hangar with adjoining airstrip.

There is a student chapter of the national society—the American Institute of Aeronautics and Astronautics.

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	F	W	S
Freshman			
Aerospace Fundamentals (AERO 121, 122, 123)	2	2	2
* Manufacturing Processes electives		1	1
Digital Computer Applications (ENGR 251)			2
Applied Descriptive Geometry (ETME 141)	2		
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Physics (PHYS 131, 132)		4	4
Freshman Composition (ENGL 104, 105)	3	3	
General Zoology (ZOO 131)		4	
General Psychology (PSY 202)	3		
General Chemistry (CHEM 124)			4
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective	3		
	17	18	17
Sophomore			
Principles of Speech (SP 200) or Public Speaking (SP 201)			3
Applied Aerodynamics (AERO 201)		3	
Aero Laboratory (AERO 203)	2		
Strength of Materials (CE 208, 209)		3	3
Electric Circuit Theory and Laboratory (EE 201, 261)			4
* Manufacturing Processes elective			1
General Physics (PHYS 133)	4		
Engineering Mechanics (ME 211, 212)	3	4	
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Advanced Engineering Mathematics (MATH 318)			4
General Chemistry (CHEM 125)	4		
American and California Government (POLS 201)		3	
Introduction to Sociology (SOC 105) or Cultural Anthropology (ANT 201)			3
	17	17	18
Junior			
Aerothermodynamics and Laboratory (AERO 301, 302, 303, 304)	4	4	5
Stress Analysis (AERO 324)			4
Aerodynamics (AERO 306)			3
Introduction to Numerical Methods (CSC 332)	3		
Electronics (EL 321)		3	
Materials Engineering (MET 306)		3	
Survey of Economics (ECON 201)		3	
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective		3	4
American Democracy and World Affairs (HIST 206)	5		
Wind Tunnel and Flight Test Laboratory (AERO 307)	2		
Mechanical Vibrations (ME 316)	3		
	17	16	16
Senior			
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective			3
Stability and Control (AERO 415)	3		
Aero Design (AERO 444, 445)	4	4	
Senior Project and Seminar (AERO 461, 462, 463)	2	2	2
Gas Dynamics (AERO 404)	4		

* ETMP 121 required; the remaining two units may be selected from ETMP 144, IE 141, 142.

† 17 units of ART/HUM/LIT/PHIL/TH electives from approved departmental list, to be selected in accordance with the General Education—Breadth and A.B.E.T. requirements.

	F	W	S
Propulsions (AERO 401).....		4	
Engineering Economics (IE 414).....			3
* Aeronautical Engineering Science electives.....		3	2
* Aeronautical Engineering electives.....	3	3	3
† Humanities elective.....			4
	16	16	17

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



** To be chosen with adviser approval.

† To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (See adviser or department office.)

CURRICULUM IN MECHANICAL ENGINEERING

The Mechanical Engineering curriculum 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 test, supervision of manufacture and erection.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in nuclear 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 nuclear power plants. The curriculum is accredited by 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.

There are two organized student clubs associated with Mechanical Engineering: a student branch of the American Society of Mechanical Engineers and a student branch of the Society of Automotive 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 nuclear concentration and petroleum concentration below.

Nuclear

The nuclear concentration places emphases on nuclear energy for those who may wish to develop a particular expertise in design for use of nuclear power. Entrance to this concentration is subject to approval of the department head.

Petroleum

The petroleum concentration places emphasis on the engineering necessary for the production and field development of petroleum reserves.

Freshman	F	W	S
Thermal and Mechanical Systems (ME 134, 136)	3	3	
Applied Descriptive Geometry (ETME 141)	2		
Engineering Drawing Systems (ETME 142)			2
* Manufacturing Processes electives	1	2	2
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 124, 125)	4	4	
General Physics (PHYS 131)		4	4
Freshman Composition (ENGL 104, 105)	3		3
Digital Computer Applications (ENGR 251)			2
	17	17	17
Sophomore			
Engineering Mechanics (ME 211, 212)	3		4
Strength of Materials (CE 208, 209)		3	3

* Chosen from ETMP 144; IE 141; ETWT 144; and either IT 141 or 327 (but not both).

	F	W	S
Materials Engineering and Laboratory (MET 306, 341)		4	
General Physics (PHYS 133)	4		
* Introduction to Modern Physics (PHYS 210)			4
Calculus, Differential Equations (MATH 241, 242)	4	4	
Advanced Engineering Mathematics (MATH 318)			4
Survey of Economics (ECON 201)	3		
American and California Government (POLS 201)	3		
American Democracy and World Affairs (HIST 206)		5	
Introduction to Sociology (SOC 105) or Cultural Anthropology (ANT 201)			3
	17	16	18
Junior			
Introduction to Design (ME 327)			5
Thermodynamics and Laboratory (ME 302, 303, 343)	3	3	1
Fluid Mechanics and Laboratory (ME 341, 342, 345)		3	4
Mechanical Vibrations and Laboratory (ME 316, 317)		4	
Heat Transfer (ENVE 313)		3	
Electric Circuit Theory and Laboratory (EE 201, 261)	4		
Electronics and Laboratory (EL 321, 361)		4	
Energy Conversion and Electromagnetics (EE 325)			3
Energy Conversion Laboratory (EE 365)			1
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective	3		
Principles of Speech (SP 200) or Public Speaking (SP 201)	3		
Psychology (PSY 202)			3
‡ Electives and courses to complete major	4		
	17	17	17
Senior			
Mechanical Control Systems (ME 422)	4		
Senior Project and Seminar (ME 461, 462, 463)	2	2	2
Engineering Economics (IE 414)	3		
General Zoology (ZOO 131)		4	
Thermal Systems Design (ME 440)			3
ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		7	7
‡ Electives and courses to complete major	8	4	4
	17	17	16

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

* CHEM 305 and CHEM 355 may be substituted.

† 17 units if ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives from approved departmental list. To be selected in accordance with the General Education-Breadth requirements.

‡ 20 elective units must be chosen in a field of concentration. Concentration lists are available in the departmental office.

CIVIL ENGINEERING DEPARTMENT

Department Head, Peter Y. Lee

Fathy Akl

Charles P. Davis

Robert E. Sennett

Marshall L. Anderson

Stuart E. Larsen

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. Civil Engineering education emphasizes the study of engineering principles and the application of scientific knowledge and technology for the betterment of mankind. The program emphasizes the team design concept and systems approach to problem solving and is accredited by the Accreditation Board for Engineering and Technology.

Graduates of the program will be trained for the expanding needs of the society in transportation, structure and environment under the broad Civil Engineering degree. The emphasis is on preparation for immediate entry into the profession, and students completing the program will find a wide variety of positions available in local, state, and federal government service or with a private engineering firm. 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.



CURRICULUM IN CIVIL ENGINEERING

Freshman	F	W	S
Civil Engineering Fundamentals (CE 121, 122, 123)	2	2	2
Applied Descriptive Geometry (ETME 141)	2		
Engineering Problems—Digital Computers (ENGR 251)			2
Engineering Surveying (AE 237)			2
• Manufacturing Processes	1	1	
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 124, 125)	4	4	
General Physics (PHYS 131)			4
Freshman Composition (ENGL 104, 105)	3	3	
** Literature elective		3	
Physical Geology (GEOL 201)			3
	16	17	17

• ETMP 121 required; the remaining unit of MP may be selected from ETMP 144; IE 141; ETWT 144.

** To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Sophomore			
Introduction to Traffic Problems and Transportation (CE 221)	4		
Civil Engineering Materials (CE 228)			3
Strength of Materials (CE 208, 209)		3	3
Engineering Mechanics (ME 211, 212)	3	4	
Engineering Surveying (AE 238, 239)		2	2
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Statistical Analysis (STAT 321)			3
General Physics (PHYS 132, 133)	4	4	
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective			3
Microeconomics (ECON 221)			4
American and California Government (POLS 201)	3		
	<u>18</u>	<u>17</u>	<u>18</u>
Junior			
Structural Analysis (CE 322, 323)	3	3	
Materials of Engineering (MET 306)	3		
Public Works Design (CE 325)			3
Civil Engineering Materials (CE 329)	3		
Fluid Mechanics (ME 341)	3		
Electric Circuit Theory (EE 201)			3
Electric Circuits Laboratory (EE 261)			1
Metals Engineering Laboratory (MET 341)		1	
American Democracy and World Affairs (HIST 206)		5	
* Philosophy elective			3
Thermodynamics (ME 302)		3	
Advanced Engineering Math (MATH 318)	4		
Mechanical Vibrations (ME 316)			3
General Zoology (ZOO 131)			4
Drainage Systems (CE 326)		3	
* ART/MU/TH elective		3	
	<u>16</u>	<u>18</u>	<u>17</u>
Senior			
Steel Structures (CE 423)	4		
Senior Project (CE 461, 462)		2	2
Undergraduate Seminar (CE 463)			2
Professional Practice (CE 464)		3	
Air Quality/Quality Control (ENVE 325,330)	3		3
Engineering Economics (IE 414)		3	
General Psychology (PSY 202)			3
Principles of Speech (SP 200) or Public Speaking (SP 201)		3	
* Literature elective (300-400 level)	3		
Humanities (HUM 402)		3	
† Approved technical electives	3	3	3
* Anthropology or Sociology elective	3		
	<u>16</u>	<u>17</u>	<u>13</u>

* To be selected in accordance with General Education-Breadth requirements with adviser approval.

† To be selected with adviser approval from departmental list.

ELECTRONIC AND ELECTRICAL ENGINEERING DEPARTMENT

Department Head (Acting), Michael M. Cirovic

Richard A. Bucich
Thomas T. L. Chou
Edward J. Clerkin
Clifford B. Cloonan
S. K. Datta
Art Dickerson
Richard K. Dickey

Eugene D. Fabricius
Michael J. Fitzpatrick
Saul Goldberg
Harry Hazebrook
Robert E. Lee
John W. McCombs
Wayne E. McMorran

Shien-Yi Meng
Jacques C. Sabto
Terry R. Stanhope
James H. W. Tseng
Donley J. Winger
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 B.S. Degree in Electronic Engineering and the B.S. 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 during the junior year.

The main objective of the department is to prepare the student for engineering; i.e., finding the answers to urgent problems in reshaping the environment to meet human needs, taking into account all implications. The curriculum provides a sound theoretical background along with current, immediately useful, practical engineering knowledge. The student begins the major in the first term with orientation and generally has one or more major courses each term until graduation. The many laboratory courses provide practical instrumentation experience and lead logically into design beginning in mid-third year.



Senior students select specialized interest courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work directly 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 capability to apply that knowledge creatively to practical problems of design with a minimum of supervision. 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 practice-oriented Master of Engineering degree is awarded to students completing the 45-unit graduate program. More detailed information is provided in the *Graduate Studies Issue* of the Announcements.

Students are encouraged to participate in appropriate professional clubs such as: the Institute of Electrical and Electronic Engineers Student Branch, an international professional society; Eta Kappa Nu, a National Electrical and Electronic scholastic honor society; Poly Phase Club, an active socially oriented organization; International Society for Hybrid Microelectronics; 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
Orientation (EE 110)	1		
Intro to DC Circuit Analysis (EE 112)			2
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 124, 125)	4	4	
General Physics (PHYS 131, 132)		4	4
Freshman Composition (ENGL 104)	3		
Report Writing (ENGL 218)			3
General Zoology (ZOO 131)		4	
Fortran Programming (CSC 101)	2		
Electronic Graphics and Standards (ETME 156)	2		
Microbonding (ETWT 152)		2	
Electronic Assembly Techniques (ETMP 244)			2
Principles of Speech (SP 200) or Public Speaking (SP 201)			3
	16	18	18
Sophomore			
Electric Circuits (EE 211, 212)	3	3	
Electric Circuits Laboratory (EE 241, 242)	1	1	
Introduction to Electric and Magnetic Fields (EL 207)		3	
Electronic Devices (EL 208)			3
Electronic Devices Laboratory (EL 248)			1
Logic and Switching Circuits (EL 219)	3		
Numerical Engineering Analysis (CSC 311)			3
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Advanced Engineering Mathematics (MATH 318)			4
Engineering Mechanics (ME 211, 212)	3	4	
Materials Engineering (MET 306)	3		
American Democracy and World Affairs (HIST 206)			5
Traditional Logic (PHIL 221)		3	
	17	18	16

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 basic circuit, field and device theory accompanied by logic and switching circuit design. Course updating keeps the curriculum in step with current technical advancements in the electronic field.

Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications, 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 instrumentation experience, but also design experience.

164 Electronic and Electrical Engineering

Junior	F	W	S
Signal Transmission (EL 303)			3
Signal Transmission Laboratory (EL 343)			1
Digital Integrated Electronics (EL 307)	3		
Digital Integrated Electronics Laboratory (EL 347)	1		
Electronic Circuits (EL 308)		3	
Electronic Circuits Laboratory (EL 348)		1	
Integrated Electronic Circuits (EL 309)			3
Integrated Electronic Circuits Laboratory (EL 349)			1
Digital System Design (EL 319)		3	
Electromagnetic Fields I (EL 334)			3
Network and System Analysis (EE 301)	3		
Advanced Circuit Laboratory (EE 341)	1		
Linear Control Systems (EE 302)		3	
Energy Conversion Electromagnetics (EE 325)	3		
Energy Conversion Laboratory (EE 365)	1		
Modern Physics (PHYS 211)	4		
Thermodynamics (ME 302)		3	
Heat Transfer (ENVE 313)			3
Survey of Economics (ECON 201)		3	
American and California Government (POLS 201)			3
	16	16	17
Senior			
Electromagnetic Fields II (EL 401)	3		
Signal Processing (EL 414)	3		
Senior Project (EL 461, 462)	2	2	
Undergraduate Seminar (EL 463)	2		
* Approved technical electives	4	4	3
Solid State Physics for Engineers (PHYS 412)	3		
Solid State Physics Laboratory for Engineers (PHYS 452)		1	
Human Values (HUM 402)		3	
† ART/MU/TH elective			3
† Literature electives (at least 3 units at 300-400 level)		4	4
General Psychology (PSY 201 or 202)		3	
Engineering Economics (IE 414)			3
History of American Technology (HIST 306)			3
	17	17	16

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. Course updating keeps the curriculum in step with current technical advancements in the electrical field.

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.

* A minimum of 2 senior design laboratories with EL or EE prefixes and two design lecture courses in the major are required.

† To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (See adviser or department office.)

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
Network and System Analysis (EE 301)	3		
Advanced Circuit Laboratory (EE 341)	1		
Linear Control Systems (EE 302)		3	
Control Systems Laboratory (EE 342)		1	
Power Transmission (EE 303)			3
Power Transmission Laboratory (EE 343)			1
Energy Conversion Electromagnetics (EE 325)	3		
Energy Conversion Laboratory (EE 365)	1		
Digital Integrated Electronics (EL 307)	3		
Digital Integrated Electronics Laboratory (EL 347)	1		
Electronic Circuits (EL 308)		3	
Electronic Circuits Laboratory (EL 348)		1	
Integrated Electronic Circuits (EL 309)			3
Integrated Electronics Circuits Laboratory (EL 349)			1
Digital System Design (EL 319)		3	
Electromagnetic Fields I (EL 334)			3
Introduction to Modern Physics (PHYS 210)	4		
Thermodynamics (ME 302)		3	
Heat Transfer (ENVE 313)			3
Survey of Economics (ECON 201)		3	
American and California Government (POLS 201)			3
	16	17	17
Senior	F	W	S
Power System Analysis I (EE 406)	4		
Senior Project (EE 461, 462)	2	2	
Undergraduate Seminar (EE 463)			2
Fluid Mechanics (ME 341)	3		
* Approved technical electives	4	6	1
Human Values (HUM 402)			3
* ART/MU/TH elective			3
Literature electives (at least 3 units at 300-400 level)		4	4
General Psychology (PSY 201 or 202)		3	
Engineering Economics (IE 414)	3		
History of American Technology (HIST 306)			3
	16	15	16

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

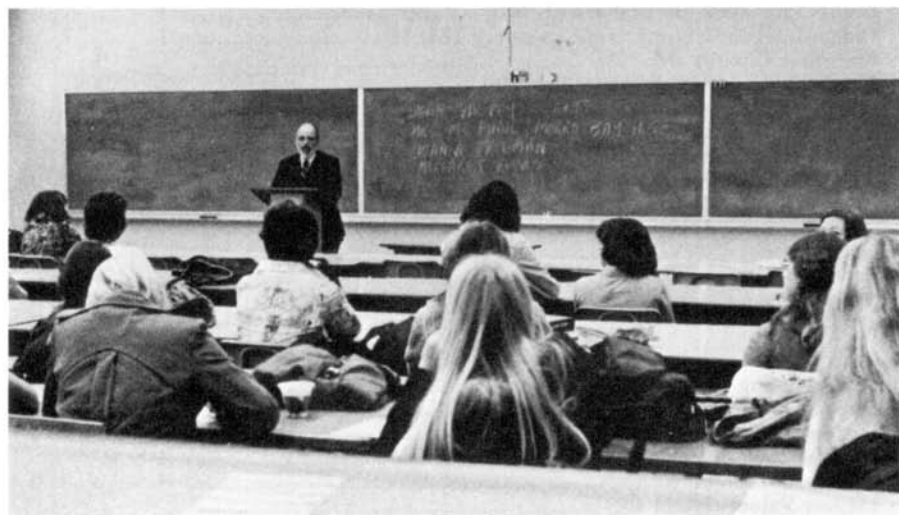
- * A minimum of two senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required.
- * To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (See adviser or department office.)

ENGINEERING SCIENCE

(An Interdisciplinary Program)

Coordinator, William F. Horton

The curriculum in Engineering Science is designed for those students seeking comprehensive education in the fundamental principles and concepts of engineering 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, system engineering, pre-medicine, etc.



The engineering sciences are based on an extensive study of mathematics, physics, and chemistry. They 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 theory, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes, including heat and mass transfer.

The curriculum provides ample elective time for the selection of courses appropriate to the student's career objectives. Of the total 29 elective units, 20 are required to be chosen from a list of design, systems and synthesis courses.

At the beginning of the junior year, and no later than the end of the first quarter, the student will be required to submit to the Coordinator a "study plan" of electives. They must form a meaningful sequence of courses combining a consistent engineering and/or science flavor.

CURRICULUM IN ENGINEERING SCIENCE

Freshman	F	W	S
Introduction to DC Circuit Analysis (EE 112)			2
Digital Computer Applications (ENGR 251)			2
* Manufacturing Processes electives	2		2
Applied Descriptive Geometry (ETME 141)		2	
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 124, 125)	4	4	

* To be selected from ETMP 144, 145; ETWT 144, 152; ENGR 302.

	F	W	S
General Physics (PHYS 131, 132)		4	4
Freshman Composition (ENGL 104, 105)	3	3	
** Literature elective			3
** General Zoology (ZOO 131)	4		
	17	17	17
Sophomore			
Engineering Mechanics (ME 211, 212)	3	4	
Strength of Materials (CE 207)			5
Strength of Materials Laboratory (CE 229)			1
Basic Circuit Analysis (EE 211, 212)	3	3	
Basic Circuits Laboratory (EE 241, 242)	1	1	
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Advanced Engineering Mathematics (MATH 318)			4
General Physics (PHYS 133)	4		
Modern Physics (PHYS 211)		4	
General Psychology (PSY 202)			3
Principles of Speech (SP 200) or Public Speaking (SP 201)	3		
** Philosophy elective			3
	18	16	16
Junior			
Network and Systems Analysis (EE 301)		3	
Advanced Circuits Laboratory (EE 341)		1	
Electronics Devices (EL 208)			3
Electronics Devices Laboratory (EL 248)			1
Theory of Materials (MET 301, 302)	4	4	
Report Writing (ENGL 218) or Corporate Communication (ENGL 310)			3
American and California Government (POLS 201)	3		
Principles of Economics (ECON 201 or 211)		3	
Mathematics or Statistics elective.....	3		
Introduction to Numerical Analysis (CSC 332)			3
Thermodynamics (ME 302, 303)	3	3	
Heat Transfer (ENVE 313)		3	
** Anthropology or Sociology elective.....	3		
American Democracy and World Affairs (HIST 206)			5
** Art, Music, or Theatre elective.....			3
	16	17	18
Senior			
† Senior Project		2	2
† Undergraduate Seminar	2		
Human Values (HUM 402)	3		
Fluid Mechanics (ME 341)	3		
** ART/FOR LANGS/LIT/PHIL electives		3	3
† Technical Electives	6	6	8
Engineering Economics (IE 414).....		3	
Electives	3	3	3
	17	17	16

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

** To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† To be selected in an appropriate engineering discipline.

‡ Technical elective units must be chosen with the approval of the adviser.

ENGINEERING TECHNOLOGY DEPARTMENT

Department Head (Acting), William R. Backer

Franklin P. Abshire	Willis Arnold Finchum	Thomas D. Kay
Ray R. Allen	Fred S. Friedman	Irvin J. Kogan
Ian C. Begg	Gary A. Granneman	William J. Phaklides
Mark A. Cooper	Theodore G. Graves	Robert L. Rogers
Franklin S. Crane	Michael Hawes	Steven O. Stocker
Kim Davis	Earl R. Hesch	Alvin D. Varney
James R. Ehrenberg	Robert K. Janeway	

The Accreditation Board for Engineering and Technology defines engineering technology: "Engineering technology is that part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational spectrum between the craftsman and the engineer at the end of the spectrum closest to the engineer."

The engineering technologist is somewhat less specialized than the engineer, focusing on a wider range of subject matter and skills. In general, the Bachelor of Science in Engineering Technology has less depth in basic and engineering sciences but more specific capability and training in skills and in the areas of production, applied design, equipment modification, service and repair. The Engineering Technology baccalaureate graduate has more depth in both theory and skills than the associate degree technician. In fact, the program is structured to maximize transfer credit from associate technology programs offered by the California Community College system. Considerably more than half of the students in the program are transfer students from these institutions. Field trips to industrial organizations and operations are an on-going part of the Engineering Technology program.

The curriculum in engineering technology is composed of a core of courses taken by all students plus the options shown below. Each student must select one or more of the options for an area of specialization. All options of the curriculum are accredited by the Accreditation Board for Engineering and Technology.

The Bachelor of Science in Engineering Technology training leads to careers in production, quality assurance, field service, maintenance, testing and marketing.

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 the practical and applied aspects of the electronic field with study in analog circuits, communication systems, control systems, digital computers, and instrumentation.

Manufacturing Processes Technology

Emphasizes design and construction of production tooling, and the study of traditional and nontraditional methods of manufacturing processes, including numerical control.

Mechanical Technology

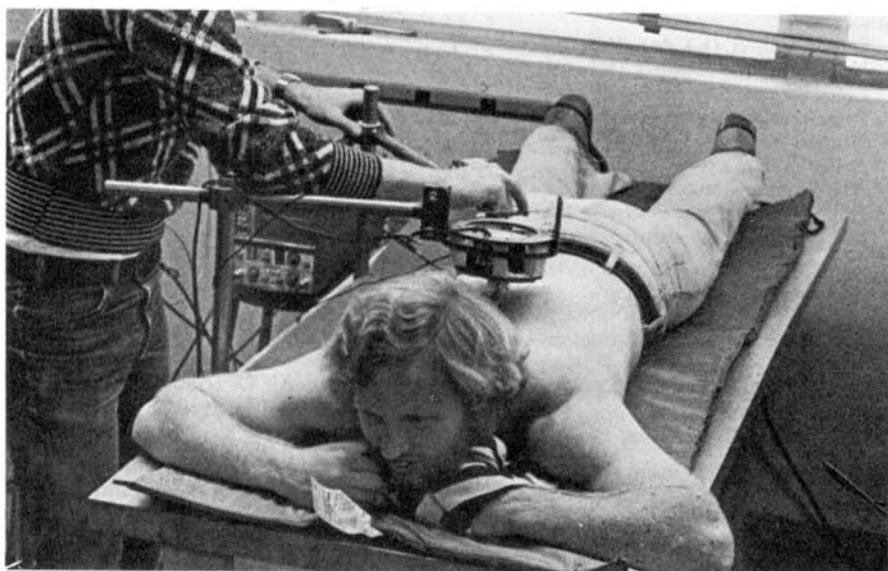
Emphasizes applied machine design, mechanical equipment and systems, including fluid power, process control instrumentation, production planning and supervision, plant equipment repair and maintenance.

Welding Technology

Emphasizes all aspects of the welding field including techniques, nondestructive testing, power sources, and production problems.

CURRICULUM IN ENGINEERING TECHNOLOGY

Freshman	F	W	S
Introduction to DC Circuits (ETEL 124)	4		
Introduction to AC Circuits (ETEL 125)		4	
Electrical Practices (ETEL 126)			4
* Manufacturing Processes electives	2	1	
* Applied Descriptive Geometry (ETME 141 or ETME 156)	2		
* Engineering Drawing Systems (ETME 142 or ETAC 122)			2
College Algebra and Trigonometry (MATH 120)	5		
Technical Calculus (MATH 131, 132)		4	4
College Physics (PHYS 121, 122)		4	4
Freshman Composition (ENGL 104, 105)	3	3	
Electives and courses to complete major			4
	16	16	18



Sophomore	F	W	S
* Manufacturing Processes elective	2		
Production Costs Estimating (IE 201)		3	
Digital Computer Applications (ENGR 251)			2
Statics (ETME 205)	3		
Dynamics (ETME 206)		4	
General Zoology (ZOO 131)			4
Technical Calculus (MATH 133)	4		
College Physics (PHYS 123)	4		
General Chemistry (CHEM 121)		4	
Metallurgy for Engineering Technology (MET 235)			4
Principles of Speech (SP 200)			3
Electives and courses to complete major	4	6	5
	17	17	18

* To be selected with approval of adviser.

170 Engineering Technology

	F	W	S
Junior			
Thermodynamics (ETME 301)	4		
Corporate Communications (ENGL 310)	3		
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)		3	
General Psychology (PSY 201)			3
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
* Literature elective		3	
American and California Government (POLS 201)	3		
* SOCS elective			3
** Approved technical electives	3	3	4
Electives and courses to complete major	4	4	3
	17	16	16
Senior			
Senior Project (ET 461, 462)	2	2	
Undergraduate Seminar (ET 463)	2		
* Literature elective (300-400 level)		4	
Principles of Engineering Economics (IE 403)	3		
Human Values (HUM 402)			3
* Philosophy elective			3
* Art, Foreign Languages, Music, or Theatre elective		4	
** Approved technical electives	4	4	4
Electives and courses to complete major	4	4	4
	15	18	14

AIR CONDITIONING-REFRIGERATION TECHNOLOGY OPTION

(Add courses below to basic curriculum)

Freshman	Junior
ETAC 121 Air Conditioning and Refrigeration Principles (4)	ETAC 321 Air Distribution Systems.. (3)
ETAC 123 Environmental Graphics .. (2)	ETAC 331 Refrigeration Systems..... (4)
Sophomore	Senior
ETAC 221 Mechanical Equipment of Buildings (3)	ETAC 332 Refrigeration Systems..... (4)
ETAC 201 Air Conditioning and Refrigeration Codes..... (2)	ETAC 425-6 Air Conditioning Systems (8)
ETAC 214 Plumbing and Building Sanitation (4)	ETAC 439 Instruments and Controls (3)
ETMP 246 Duct Design and Fabrication (2)	

ELECTRONIC TECHNOLOGY OPTION

(Add courses below to basic curriculum)

Freshman	Junior
ETEL 218 Digital Circuits I (3)	ETEL 311 Transmission Lines and Antennas (4)
Sophomore	Senior
ETEL 232-3 Electronic Circuits and Devices..... (8)	ETEL 312 Active Linear Circuits (4)
ETEL 234 Passive Network Analysis (4)	ETEL 334 Digital Circuits II (4)
	ETEL 335 Communications I..... (4)
	ETEL 435 Communications II (4)
	ETEL 438 Computer Technology I.... (4)

* To be selected in accordance with General Education-Breadth and A.B.E.T. requirements (skills courses are not acceptable). (See adviser or department office.)
 ** To be selected with approval of adviser.

MANUFACTURING PROCESSES TECHNOLOGY OPTION

(Add courses below to basic curriculum)

Freshman		Junior	
MFGE 233 Computer Aided Manufacturing.....	(2)	ETMP 325 Abrasive Machining and Finishing.....	(2)
Sophomore		ETMP 321-2-3 Tool Design.....	(9)
ETMP 224 Advanced Machining Technology.....	(4)	IE 214 Production Control.....	(2)
ETMP 245 Advanced Machining Operations.....	(2)	Senior	
ETWT 235 Nondestructive Examination.....	(4)	ETMP 434-5-6 Tool and Manufacturing Engineering.....	(9)
ETME 344 Advanced Design Drawing.....	(2)	ETMP 421 Industrial Numerical Control.....	(3)

MECHANICAL TECHNOLOGY OPTION

(Add courses below to basic curriculum)

Freshman		Senior	
* ME 136 Thermal Systems.....	(3)	ETME 337 Instrumentation of Mechanical Systems.....	(3)
Sophomore		ETME 338 Industrial Engines.....	(3)
ETAC 221 Mechanical Equipment of Building.....	(3)	ETME 344 Advanced Design Drawing.....	(2)
Junior		Senior	
ETME 320 Mechanisms.....	(4)	ETME 421 Applied Machine Design.....	(4)
ETME 333 Industrial Hydraulics and Pneumatics.....	(4)	ETME 422 Applied Machine Design.....	(4)
		ETME 437 Applied Fluid Power Systems.....	(4)
		ETME 443 Mechanical Systems.....	(5)

WELDING TECHNOLOGY OPTION

(Add courses below to basic curriculum)

Sophomore		Junior	
ETWT 235 Nondestructive Examination.....	(4)	ETWT 259 Advanced Welding.....	(1)
MET 222 Physical Metallurgy.....	(4)	ETWT 324-5-6 Welding Technology.....	(12)
MET 223 Nonferrous Alloys.....	(2)	Senior	
CHEM 122 General Chemistry.....	(4)	ETWT 336 Welding Power Sources..	(3)
		ETWT 434-5-6 Advanced Welding Technology.....	(9)

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

* Qualified transfer students may receive departmental approval to substitute approved technical elective.

ENVIRONMENTAL ENGINEERING DEPARTMENT

Department Head, Walter E. Holtz

William E. Clark
Harold M. Cota

Rodney G. Keif
Dragoslav M. Mistic

Philip W. B. Niles

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, air conditioning, heating, ventilation, and refrigeration. It also includes conservation of energy and the utilization of new energy sources such as solar energy.

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 student will specialize in one of the curricular options described below. 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 as a joint exploration with the faculty. The curriculum is accredited by the Accreditation Board for Engineering and Technology.

The Environmental Sciences and Engineering Club and a student branch of the American Society of Heating, Refrigeration, and Air Conditioning Engineers offer 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.

Graduates obtain employment primarily with consulting engineers, manufacturers, contractors, and governmental agencies.

CURRICULAR OPTIONS

Air and Water Pollution Control

This option prepares students for entry into the field of pollution control. 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.

Air Conditioning-Refrigeration and Solar Energy Systems

This option prepares students to enter those phases of engineering dealing with thermal and solar environmental 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.

CURRICULUM IN ENVIRONMENTAL ENGINEERING

Freshman	F	W	S
Engineering Drawing Systems (ETME 142)	2		
General Zoology (ZOO 131)		4	
Environmental Engineering Systems (ENVE 101).....	2		
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Physics (PHYS 131, 132)		4	4
Freshman Composition (ENGL 104, 105)	3		3
General Chemistry (CHEM 124, 125)	4	4	
General Psychology (PSY 202)			3
* Survey of Organic Chemistry (CHEM 226)			4
	15	16	18

* Students concentrating in AC-R & SES may substitute CHEM 129 or PHYS 211.

	F	W	S
Sophomore			
Environmental Engineering Measurements (ENVE 251)		2	
Heating and Ventilating (ENVE 202)	3		
Fluid Systems (ENVE 231)	2		
Digital Computer Applications (ENGR 251)			2
Engineering Mechanics (ME 211, 212)		3	4
Thermodynamics (ME 302)			3
* Manufacturing Processes electives		2	2
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
General Physics (PHYS 133)	4		
Statistical Analysis (STAT 321, 322)		3	3
American and California Government (POLS 201)	3		
Survey of Economics (ECON 201)			3
Electives and courses to complete major		<u>4</u>	
	<u>16</u>	<u>18</u>	<u>17</u>
Junior			
Noise and Vibration Control (ENVE 309)	3		
Heat Transfer (ENVE 313)	3		
Environmental Air Quality (ENVE 325)	3		
Automatic Process Control (ENVE 316)			2
Strength of Materials (CE 208)			3
Fluid Mechanics (ME 341)		3	
Electric Circuit Theory (EE 201)	3		
Electric Circuit Laboratory (EE 261)	1		
Electronics (EL 321)		3	
Materials Engineering (MET 306)		3	
† Philosophy elective			3
Principles of Speech (SP 200) or Public Speaking (SP 201)			3
Corporate Communications (ENGL 310)		3	
‡ Electives and courses to complete major	<u>3</u>	<u>6</u>	<u>6</u>
	<u>16</u>	<u>18</u>	<u>17</u>
Senior			
Advanced System Design (ENVE 441, 442)	3	3	
Senior Project (ENVE 461, 462)	2	2	
Undergraduate Seminar (ENVE 463)			2
Engineering Economics (IE 414)			3
Growth of American Democracy (HIST 204) and The United States In World Affairs (HIST 205)	3		3
Human Values (HUM 402)	3		
† Literature electives (a 4-unit 300-400 level course)	3		4
† ART/TH/MU elective		4	
† SOC elective		3	
‡ Electives and courses to complete major	<u>4</u>	<u>6</u>	<u>5</u>
	<u>18</u>	<u>18</u>	<u>17</u>

* To be selected from ETMP 121, 144, 145; ETWT 144, 155; IE 141; ENGR 302.

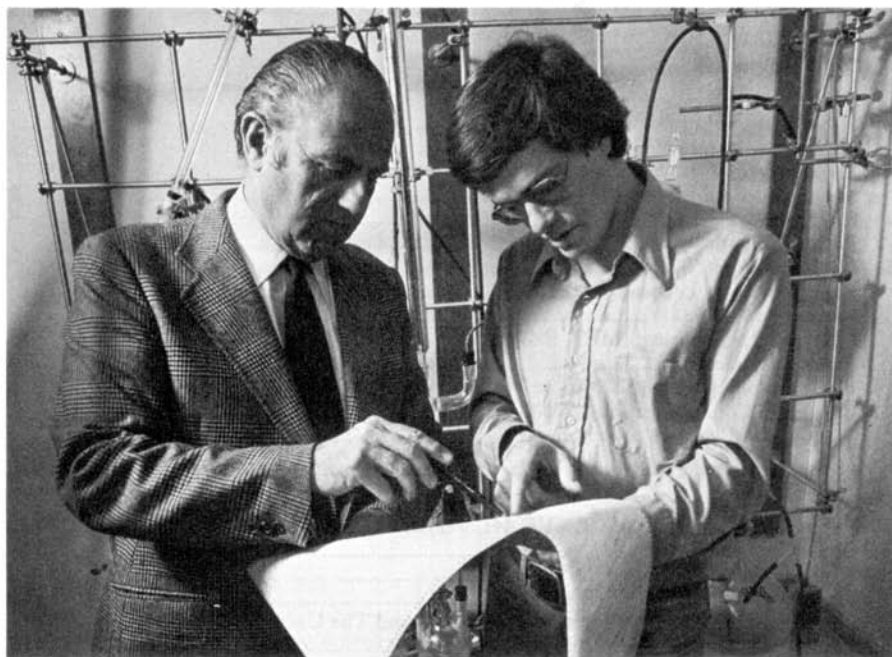
† To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (See adviser or department office.)

‡ 34 of the elective units must be chosen with the approval of the adviser according to the student's option.

AIR AND WATER POLLUTION CONTROL OPTION

(Add courses below to Basic Curriculum)

Sophomore or Junior	
CHEM 129 General Chemistry	(4)
Junior and Senior	
ENVE 304 Thermodynamics of Processes	(3)
ENVE 326 Air Pollution Measurements	(3)
ENVE 411 Air Pollution Control	(3)
ENVE 422 Environmental Radiation Surveillance	(2)
ENVE 428 Meteorology	(3)
ENVE 434 Water Quality Measurements	(2)
ENVE 435 Water and Waste Water Treatment	(4)
ENVE 439 Solid Waste Management ..	(2)
Approved technical electives	(8)



AIR CONDITIONING-REFRIGERATION AND SOLAR ENERGY SYSTEMS OPTION

(Add courses below to Basic Curriculum)

Sophomore	
ENVE 221 Solar Energy	(3)
Junior and Senior	
ENVE 305 Thermodynamics of Refrigeration	(4)
ENVE 322 Solar Energy Engineering	(3)
ENVE 352 Thermal and Fluids Laboratory	(3)
ENVE 354 Thermal and Solar Laboratory	(3)
ENVE 361 System Design	(3)
ENVE 366 Solar Energy Systems Analysis	(5)
ENVE 443 Advanced System Design ..	(3)
Approved technical electives	(7)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Environmental Engineering 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
Paul E. Scheffer

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 Industrial Engineering Bachelor of Science degree, accredited by 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 coursework 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
Introduction to Industrial Engineering (IE 101).....	3		
Industrial Systems Analysis (IE 123)		4	
Manufacturing Processes (IE 141).....	1		
* Manufacturing Processes Laboratory		2	
Man Machine Systems (IE 223).....			4
Engineering Drawing Systems (ETME 142)	2		
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 124, 125)		4	4
Freshman Composition (ENGL 104)	3		
Freshman Composition (ENGL 105)		3	
General Psychology (PSY 201 or 202)			3
** Life Science elective	3		
** Literature elective			4
	16	17	19

* ETMP 144; ETWT 144; ENGR 102; IT 141.

** To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser or department office.

176 Industrial Engineering

	F	W	S
Sophomore			
Manufacturing Engineering Laboratory (IE 251)	4		
† Manufacturing Processes Laboratory		1	
Industrial Costs and Controls (IE 239)		4	
Computer Aided Manufacturing (MFGE 233, 334)		2	3
Engineering Mechanics (ME 211)			3
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Statistical Analysis (STAT 321)			3
General Physics (PHYS 131, 132, 133)	4	4	4
American and California Government (POLS 201)			3
Principles of Economics (ECON 211, 212)	3	3	
Digital Computer Applications (ENGR 251)	2		
	<u>17</u>	<u>18</u>	<u>16</u>
Junior			
Operations Research (IE 304, 405)	3	3	
Manufacturing Design (IE 343)			4
Human Factors Engineering (IE 319)	3		
Engineering Test Design and Analysis (MFGE 424)	3		
Engineering Economics (IE 414)			3
† Technical electives		4	3
Strength of Materials (CE 208)	3		
Engineering Mechanics (ME 212)		4	
Electric Circuit Theory (EE 201)			3
Electric Circuit Laboratory (EE 261)			1
American Democracy and World Affairs (HIST 206)	5		
* Philosophy elective		3	
* Math elective and science or math elective		3	3
	<u>17</u>	<u>17</u>	<u>17</u>
Senior			
Fundamentals of Supervision (IE 441, 442)	2	1	
Senior Project (IE 461, 462)	2	2	
Undergraduate Seminar (IE 463)			2
Thermodynamics (ME 302)		3	
Fluid Mechanics (ME 341)			3
Electronics (EI 321)	3		
Electronics Laboratory (EI 361)	1		
Statistical Quality Control (IE 430)	3		
Human Values (HUM 402)			3
* ART/MU/TH electives		3	
Principles of Speech (SP 200) or Public Speaking (SP 201)			3
* English elective (330-430 series)	4		
† Technical electives	3	3	3
Electives		4	
	<u>18</u>	<u>16</u>	<u>14</u>

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

† ETMP 144; ETWT 144; ENGR 102; IT 141.

‡ A specific set of courses determined by concentration.

* To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser or department office.

INDUSTRIAL TECHNOLOGY DEPARTMENT

Department Head, Laurence F. Talbott

William L. Bruckart

Lynn S. Mosher

J. Edward Strasser

Larry W. Gay

Anthony J. Randazzo

Raymond A. Wysock

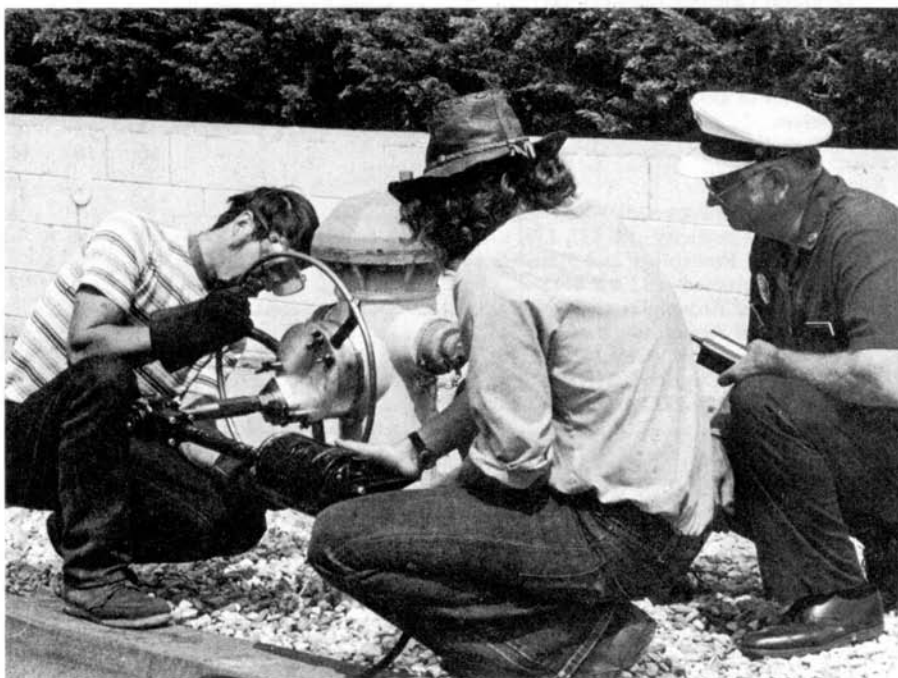
Roger L. Keep

Nelson L. Smith, III

The Industrial Technology Department offers three degree programs: 1) Bachelor of Science in Industrial Technology, 2) Bachelor of Arts in Industrial Arts, and 3) Master of Arts in Industrial Arts.

The Bachelor of Science program in Industrial Technology prepares graduates for employment in a broad range of professional positions including production management and industrial marketing.

The program emphasizes science, technology, communication, and management. Students specialize in one of three areas: 1) production and quality management, 2) industrial sales, and 3) facilities management.



The Bachelor of Arts in Industrial Arts program prepares students to teach Industrial Arts in public schools and community colleges and for careers in industry. Emphasis areas are automotives, wood, plastics, drafting, metals, electronics, and graphic arts.

The Master of Arts in Industrial Arts degree program is offered for qualified graduates interested in industrial education, whether in the public schools or in industry.

Each student gains a substantial general education through courses in the areas of language communication, social sciences, mathematics, physical education and the arts. The ability to communicate in technical areas is further developed through courses in technical writing and technical drawing. Also of major importance is the development of the ability to work with people.

CURRICULUM IN INDUSTRIAL TECHNOLOGY

This Bachelor of Science degree program 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.

Freshman	F	W	S
Technical Computation (IT 101).....	2		
Industrial Technology Careers (IT 112)	1		
Fundamentals of Technical Drawing (ETME 142)			2
* Manufacturing Processes		2	2
College Algebra and Trigonometry (MATH 120)	5		
Technical Calculus (MATH 131)		4	
Freshman Composition (ENGL 104, 105).....	3	3	
College Physics (PHYS 121, 122)		4	4
† ANT/SOC elective			4
Essentials of Discussion (SP 217)	4		
Electives	1	3	4
	16	16	16
Sophomore			
General Psychology (PSY 202)			3
Industrial Electricity (IT 237, 238)	3	3	
‡ Elementary Probability and Statistics (STAT 211)		3	
‡ Statistical Methods (STAT 212)			3
Principles of Economics (ECON 211, 212)	3	3	
Principles of Accounting (ACTG 221, 222)		4	4
General Chemistry (CHEM 121, 122)	4	4	
Chemistry or Physics (CHEM 226 or PHYS 123)			4
General Zoology (ZOO 131)	4		
Electives	2		2
	16	17	16
Junior			
Quality Systems Applications (IT 350) or Fundamentals of Industrial Packaging (IT 330)			3
Industrial Electrical Systems (IT 331)	4		
Electronic Control Systems (IT 332)		4	
Electronic Computer Applications (IT 333)			3
Product Evaluation (IT 326)			2
Power Technology (IT 222)		3	
Technical Sketching (IT 245).....		2	
Plant Safety Fundamentals (IT 311)			3
Industrial Marketing (IT 405)		2	
Industrial Management (MGT 311)	3		
† ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective	3		
Marketing Principles (MKTG 204/301)	4		
† Literature electives (300-400 level).....	4		4

* Chosen from IT 141 or ENGR 302; ETMP 144; IE141; ETWT 144.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

‡ Consult with adviser. STAT 321-322 should be substituted for STAT 211-212 as prerequisites depending on the adviser-approved electives.

	F	W	S
Philosophy elective		3	
* Electives		2	1
	18	16	16
Senior			
Cost Reduction and Control (IT 406)	3		
Industrial Equipment Selection (IT 415)			3
Mechanical Systems (IT 431, 432, 433)	3	3	3
Technical Management Problems (IT 418)		4	
Industrial Technology Seminar (IT 460)	1		
Senior Project (IT 461, 462)		2	2
American and California Government (POLS 201)	3		
American Democracy and World Affairs (HIST 206)			5
Human Values (HUM 402)	3		
* Electives	3	7	3
	16	16	16

CURRICULUM IN INDUSTRIAL ARTS

This major provides for the undergraduate professional preparation of future industrial education teachers at the secondary and junior college levels. The Industrial Arts curriculum provides for instruction and laboratory experiences in drafting, wood technology, industrial plastics, electricity, electronics, metal technology, power technology, automotives, and graphic arts. Students select one concentration from the six listed below. In addition to specialization in one field, the student receives a broad basic training in most of these specialties. Graduates of this major have an extensive understanding of industrial manufacturing procedures plus the ability to work well with students in helping them to become familiar with processes of industry. The program leads to a Bachelor of Arts degree. The Single Subjects Credential (for secondary teaching) is available as part of this program.

CURRICULAR CONCENTRATIONS

Automotives

Emphasizes the industrial education teaching aspects of power mechanics and automotive technology including engines, fuel system, chassis, electronics and power trains.

Drafting

Prepares students to teach drafting in the public schools. Includes mechanical, architectural, sketching, rendering, etc.

Electronics

Prepares for the teaching of industrial education electronics with emphasis upon electronic principles, component, functions, construction testing, trouble shooting and repair of equipment plus planning, equipping and organizing for the teaching of electronic programs.

Graphic Arts

This concentration prepares the student to teach industrial arts graphic arts in the public schools. Specialized courses in this industrial area are offered by the Graphic Communications Department and by the Art Department.

Metals

Emphasis is upon a broad general metals knowledge with skill in the areas of bench metal, layout, foundry, machining, welding and related art metal as well as metal production processes suitable for secondary school instruction.

* 15 units of the above must be chosen with approval of the adviser.

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Wood-Plastics

Basic materials and processes. School wood laboratory equipment, maintenance, production processes, mill cabinet work and building construction. Processing, mold construction, process control, and test methods for plastics.

Freshman	F	W	S
Technical Computation (IT 101).....	2		
Industrial Arts Careers (IT 111).....	1		
Fundamentals of Technical Drawing (ETME 142).....	2		
Metal Technology (IT 233).....	3		
Industrial Materials (IT 229).....			3
Industrial Wood Processes (IT 125).....		3	
Mathematics (MATH 114 or 115).....		3	
Freshman Composition (ENGL 104, 105).....	3	3	
College Physics or Chemistry (PHYS 121, 122 or CHEM 121, 122).....		4	4
• Life Science elective.....			3
• ANT/SOC elective.....			3
† Electives and courses to complete major.....	<u>4</u>	<u>2</u>	<u>3</u>
	15	15	16



* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

† 23 of the elective units must be chosen with the approval of the adviser in a field of concentration.

	F	W	S
Sophomore			
Automotive Power (IT 250)			4
Technical Sketching (IT 245)		2	
General Psychology (PSY 202)	3		
American and California Government (POLS 201)		3	
Industrial Electricity (IT 237, 238)	3	3	
Furniture Design and Construction (IT 353)			3
Advanced Composition (ENGL 300)		3	
Principles of Speech (SP 200)	3		
Elementary Probability and Statistics (STAT 211)		3	
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective	3		
Survey of Economics (ECON 201)	3		
Introduction to Literature (ENGL 207)			3
* Literature elective			4
† Electives and courses to complete major		<u>2</u>	<u>3</u>
	15	16	17
Junior			
Technical Drawing (IT 444)			4
Curriculum and Methods of Industrial Education (IT 424)			3
Plastics Technology (IT 327)		3	
Industrial Design (IT 346)			2
Learning Process (ED 335)		3	
Physical Science (PHYS 123 or CHEM 226)	4		
Multicultural Education in Public Schools (ED 301)	3		
Diagnosis, Prescription and Evaluation (ED 436)			2
* Philosophy elective		3	
Instructional Processes (ED 438)		3	
Human Values (HUM 402)	3		
† Electives and courses to complete major	<u>5</u>	<u>4</u>	<u>4</u>
	15	16	15
Senior			
General Metals (IT 443)	3		
Approved 300-400 IT courses	5	3	
Industrial Education Seminar (IT 459)	1		
Senior Project (IT 461, 462)		2	2
Plant Safety Fundamentals (IT 311)	3		
Preliminary Student Teaching (ED 430) or elective courses		6	
Student Teaching (ED 440) or elective courses			12
American Democracy and World Affairs (HIST 206)		5	
Health Education (PE 250)	2		
† Electives and courses to complete major	<u>1</u>		<u>1</u>
	15	16	15

MASTER OF ARTS IN INDUSTRIAL ARTS

The Master of Arts in Industrial Arts 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 will also aid those preparing for administrative-type 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

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

† 23 of the elective units must be chosen with the approval of the adviser in a field of concentration.

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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, facilities, trends, organization, administration and research.

CURRICULUM FOR THE MASTER OF ARTS DEGREE

For University requirements see *Graduate Studies Announcement*

Required:	<i>Units</i>
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 Seminar 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 300, 400, and 500 levels, including a minimum of 6 additional units in industrial education, with adviser approval	<u>13</u>
	45

See COURSES OF INSTRUCTION section of the catalog for description of courses in Industrial Technology and other subjects.



- The student may be permitted a nonthesis/project option by accomplishing all of the following steps:
 1. Obtaining approval of the adviser and the Industrial Arts 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.
 3. Passing a comprehensive written examination covering the graduate program.

METALLURGICAL AND WELDING ENGINEERING DEPARTMENT

Department Head, Richard C. Wiley

William D. Forgeng

Harry H. Honegger
Robert B. Leonesio

George T. Murray

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 curriculum is accredited by the Accreditation Board for Engineering and Technology. It offers opportunity to pursue specialized metallurgical areas on an elective basis in the senior year.

Students who graduate as metallurgical engineers 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, metallographer, materials engineer, welding engineer, nondestructive test engineer, and inspection and quality control specialist.



The Metallurgical and Welding Engineering Department is well equipped with various laboratories and shops. 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 "wet" laboratory, a physical testing laboratory and electron microscopy.

There is a student chapter of the national 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
Introduction to Metallurgy (MET 121)	3		
* Manufacturing Processes courses		2	2
General Chemistry (CHEM 124, 125)	4	4	
General Physics (PHYS 131)			4
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
Freshman Composition (ENGL 104, 105)	3	3	
† Art, Music, or Theatre elective.....	3		
General Zoology (ZOO 131)		4	
† Literature or Philosophy elective			4
General Psychology (PSY 202)			3
	17	17	17

* Select a total of 4 units from the following: ETWT 144; ETMP 144; ENGR 302.

† To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

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Sophomore	F	W	S
Materials Engineering (MET 306)	3		
Materials Engineering Laboratory (MET 341)	1		
Physical Metallurgy (MET 222)		4	
Nonferrous Alloys (MET 223)			2
Digital Computer Applications (ENGR 251)	2		
Engineering Mechanics (ME 211, 212)		3	4
General Physics (PHYS 132, 133)	4	4	
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)			4
American Democracy and World Affairs (HIST 206)			5
American and California Government (POLS 201)		3	
Principles of Economics (ECON 211)	3		
Principles of Speech (SP 200)			3
* Literature elective		4	
	17	18	18
Junior			
Theory of Materials (MET 301, 302, 303)	4	4	4
Metallurgical Engineering (MET 324, 325, 326)	4	4	4
Statistical Analysis (STAT 321, 322)	3		3
Strength of Materials (CE 208, 209)	3	3	
Heat Transfer (ENVE 313)			3
Physical Chemistry (CHEM 305, 306)		3	3
* Social Science elective	3		
Corporate Communications (ENGL 310)		3	
	17	17	17
Senior			
Advanced Theory of Materials (MET 421, 422, 423)	4	4	4
Applied Metallurgical Engineering (MET 424, 425, 426)	3	3	3
Failure Investigation Laboratory (MET 441, 442, 443)	1	1	1
Senior Project (MET 461, 462)	2	2	
Undergraduate Seminar (MET 463)			2
Electric Circuit Theory (EE 201)	3		
Electric Circuit Laboratory (EE 261)	1		
Electronics (EL 321)		3	
Advanced technical topic	3		
Human Values (HUM 402)		3	
* Literature or Philosophy elective			4
Engineering Economics (IE 414)			3
	17	16	17

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

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

School of Human Development and Education

<i>Degree Program</i>	<i>Page</i>
B.S. Child Development	188
B.S. Dietetics—Food Administration	189
B.S. Home Economics	191
B.A. Liberal Studies	194
B.S. Physical Education	196
B.A. Recreation Administration	198
M.A. in Education	193
M.S. in Home Economics	192
M.S. in Physical Education	200

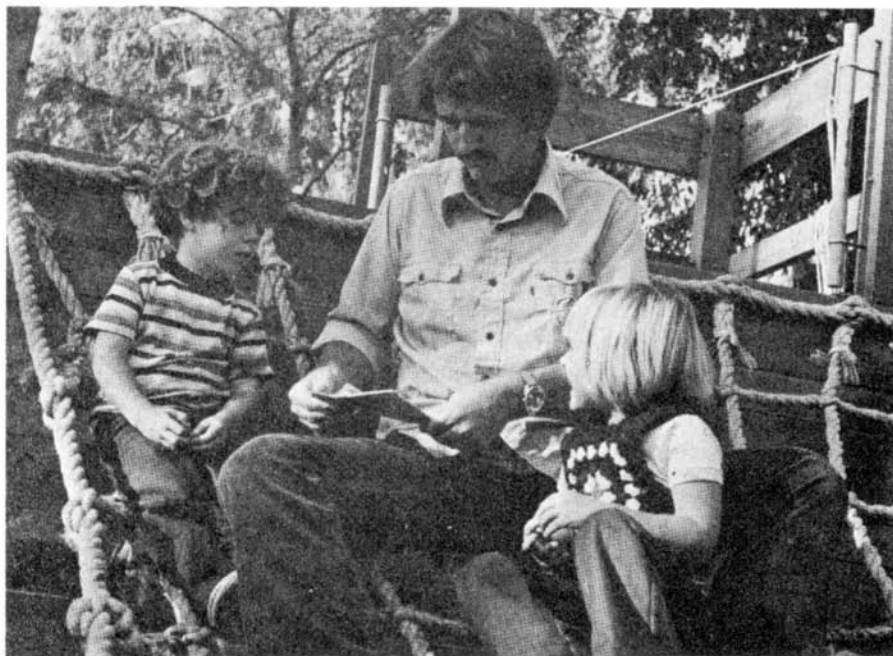
SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Carl C. Cummins, Dean
Harry J. Busselen, Associate Dean

The School of Human Development and Education offers several major curricula leading to Bachelor of Science, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments in the University in offering experiences to students that enhance their general education.

Departments offering majors are Child Development and Home Economics, and Physical Education. 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: California Association for Health, Physical Education and Recreation, Student California Teachers Association, Phi Upsilon Omicron (Home Economics), Orchesis, American Home Economics Association, California Park and Recreation Association and National Recreation and Park Association.

CHILD DEVELOPMENT AND HOME ECONOMICS DEPARTMENT

Department Head, Frances J. Parker

Robert L. Blodget	Basil A. Fiorito	Mildred E. Roske
Connie Breazeale	Ruth James	Patricia Saam
Sarah E. Burroughs	Lezlie A. Labhard	W. Fred Stultz
Robert A. Christenson	Karen S. Moerman	Bette W. Tryon
Sandra Crabtree	Krishnakumar S. Morey	Barbara P. Weber
Patricia Engle	Ann Morgan	

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 coursework from the arts, humanities, physical and social sciences. Persons with a general interest in home economics and child development will attain a sound basis for successful personal and family life.

The Child Development and Home Economics Department offers four degree programs: a Bachelor of Science degree in (1) Child Development, (2) Home Economics, (3) Dietetics-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 Dietetics Association. Applicants for admission must select one of the four majors.

CHILD DEVELOPMENT

Child Development majors complete a core of common coursework 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 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 or parents. Students may also pursue coursework 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-FOOD ADMINISTRATION

The Dietetics-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 Dietetic 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,

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schools, governmental agencies, and public eating facilities. Graduates are also prepared to pursue graduate work in dietetics, foods or nutrition.

HOME ECONOMICS

All Home Economics majors complete a basic core of professional, supportive and general education courses. Curricular concentrations are available to prepare professionals 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 or research. They work with people of all ages in a community, an office, a store, a factory, an institution, a laboratory, an agency, a playground or a home.

CURRICULUM IN CHILD DEVELOPMENT

Freshman	F	W	S
Orientation (CD 101)	2		
Pairing and Marriage (CD 103)	3		
Child, Family, and Community (CD 108)			3
Racism in America (ETHS 114)		3	
Laboratory I: Beginning Study of Children and Families (CD 130)		3	
General Psychology (PSY 201/202)		3	
English Composition (ENGL 114, 115)	4	4	
Introduction to Sociology (SOC 105)			3
Cultural Heritage (ETHS 210)			3
General Biology (BIO 101)	3		
Mathematics (MATH 109/111/113)			3
Art elective		3	
Health Education (PE 250)			2
Safety and First Aid (PE 280)	2		
* Electives and courses to complete major concentration	2		2
	16	16	16
Sophomore			
Family Development (CD 203)	3		
Infancy and Toddler Development (CD 125)	3		
Preschool and Middle Childhood Development (CD 225)		3	
Preschool Program Planning (CD 229)			3
Laboratory II: Children and Families in the Preschool (CD 230)			4
† Children's Drama (TH 347)		3	
Music (MU 100/204/205)		3	
‡ Life Science and Physical Science electives (one with laboratory)		3	3
Principles of Speech (SP 200)		3	
† Children's Literature (ENGL 260)	3		
American History (HIST 204)	3		
U.S. in World Affairs (HIST 205)			3
Nutrition (HE 210)			3
Anthropology (ANT 201 or 203)	3		
Physical Education activity		1	
* Electives and courses to complete major concentration	1		
	16	16	16

* Of the total elective units, 21 shall be chosen in a field of concentration with the approval of the student's advisor.

† May substitute any 300-level literature course.

‡ To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

Junior	F	W	S
The Helping Relationship (CD 304)		3	
Adolescence (CD 325)			3
Advanced Composition (ENGL 300)	3		
Survey of Economics (ECON 201)		3	
American and California Government (POLS 201)			3
Anthropology (ANT 301, 333, or 341)	3		
Maternal and Child Nutrition (HE 310)	3		
Consumer Role of the Family (HE 203)			3
Human Inheritance (BIO 302)		3	
Human Sexuality (PSY 303)	2		
Introduction to Research in Child and Family Studies (CD 329)			3
* Electives and courses to complete major concentration	5	4	4
Music for Children (MU 301)		3	
	16	16	16

Senior			
Adulthood and Aging (CD 425)			3
Parent-Child Relationships (CD 413)	3		
† Senior Project (CD 461, 462)	2	2	
Undergraduate Seminar (CD 463)			2
Abnormal Psychology (PSY 307)		3	
Political Philosophy (PHIL 333)			3
§ Literature elective		3	
* Electives and courses to complete major concentration	8	8	8
‡ Philosophy or Literature elective	3		
	16	16	16

CURRICULUM IN DIETETICS—FOOD ADMINISTRATION

Freshman			
Fundamentals of Food (HE 121)		4	
Design Analysis for Home Economists (HE 122)	3		
General Chemistry (CHEM 121, 122)	4	4	
English Composition (ENGL 114, 115)		4	4
Introduction to Sociology (SOC 105)			3
Mathematics Elective (MATH 113, 114, or 118)	3		
Health Education (PE 250)	2		
§ Art elective			3
§ Literature elective			3
Consumer Role of the Family (HE 203)			3
Nutrition (HE 210)		3	
Electives	2	2	
	15	17	16

* Of the total elective units, 21 shall be chosen in a field of concentration with the approval of the student's adviser.

† One quarter of CD 330 or CD 453 shall have been successfully completed before the student will be permitted to enroll in Senior Project (CD 461).

‡ To be selected from PSY 432, 454, 456, ED 480.

§ To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

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	F	W	S
Sophomore			
Principles of Accounting (ACTG 221, 222)		4	4
Problems of Family Housing (HE 207)	3		
Home Food Conservation (HE 226)	2		
Meat Procurement and Use (FDSC 209).....		3	
Elementary Probability and Statistics (STAT 211)			3
General Zoology (ZOO 131)		4	
Survey of Organic Chemistry (CHEM 226)	4		
General Bacteriology (BACT 221)			4
Principles of Purchasing (MGT 206)	3		
General Psychology (PSY 201 or 202)			3
Principles of Speech (SP 200)		3	
Physical Education activity		1	
Survey of Economics (ECON 201)		3	
Electives	4		3
	16	18	17
Junior			
Maternal and Child Nutrition (HE 310)			3
Food Management (HE 321)	3		
Advanced Nutrition (HE 328)		4	
Experimental Nutrition (HE 348)			2
Human Anatomy and Physiology (ZOO 237, 238, 239).....	3	3	3
Biochemistry (CHEM 328)	4		
Behavior in Organizations (PSY 302).....	3		
The Learning Process (ED 335)		3	
Industrial Relations (MGT 313)			3
Cultural Anthropology (ANT 201)		3	
Advanced Composition (ENGL 300)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3		3
* Literature or Philosophy elective.....		3	
	16	16	17
Senior			
Community Nutrition (HE 416)		3	
Methods of Teaching Nutrition (HE 415)	3		
Cultural and Aesthetic Aspects of Food (HE 421)			3
Quantity Food Preparation (HE 425)	3		
Food Systems Management (HE 426)		3	
Equipment and Layout (HE 427)			3
Diet Therapy (HE 429)	4		
Senior Project (HE 461, 462)		2	2
Undergraduate Seminar (HE 463)		2	
Food Microbiology (BACT 421)	4		
* Philosophy elective			3
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Electives		3	3
	17	16	17

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.) At least 6 units must be 300-400.

CURRICULUM IN HOME ECONOMICS

	F	W	S
Freshman			
* Child, Family and Community (CD 108)		3	
Fundamentals of Foods (HE 121)			4
Design Analysis for Home Economists (HE 122)		3	
Contemporary Textile Products (HE 220)			3
English Composition (ENGL 114, 115)	4	4	
† Mathematics elective	3		
** Art elective	3		
Orientation to Home Economics (HE 101)	2		
Health Education (PE 250)			2
Introduction to Sociology (SOC 105)			3
General Chemistry (CHEM 121, 122)	4	4	
Electives		3	5
	16	17	17
Sophomore			
Consumer Role of the Family (HE 203)	3		
Problems of Family Housing (HE 207)		3	
Nutrition (HE 210)			3
Family Development (CD 203)			3
Interior Design (HE 242)			4
General Psychology (PSY 201 or 202)	3		
Principles of Speech (SP 200)			3
Physical Education activity		1	
Survey of Economics (ECON 201)	3		
** Life and Physical Sciences electives (CHEM 226, ZOO 131, BACT 221, BIO 101, BOT 121)	3	4	
** ART, FOR LANGS, HUM, LIT, MU, PHIL, TH electives		3	3
Electives	4	6	
	16	17	16
Junior			
Maternal and Child Nutrition (HE 310)		3	
Food Management (HE 321)	3		
Textiles (HE 322)	3		
Management of Family Resources (HE 324)			3
Demonstration Techniques (HE 326)			3
Household Equipment (HE 331)		4	
Advanced Composition (ENGL 300)		3	
Dynamics of Clothing (HE 341)		3	
** Literature elective			3
** Philosophy elective			3
Electives	11	4	4
	17	17	16

* CD 130 may be substituted with prior approval of adviser.

† MATH 109 recommended for students who need basic review.

** To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

Senior	F	W	S
Senior Project (HE 461, 462)	2	2	
Undergraduate Seminar (HE 463)	2		
American and California Government (POLS 201)	3		
† American Democracy and U.S. in World Affairs (HIST 204, 205)		3	3
• Philosophy or Literature elective	3		
HE 404, 421, 422, 432, 433		3	
Electives	7	9	12
	17	17	15

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

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

Required:	Units
HE 511 Research Design	3
HE 580 Seminar	3
HE 599 Thesis or additional approved course work and comprehensive examination	6
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.....	12
Electives selected from 400 to 500 series level	9
	45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Child Development, Home Economics, and other subjects.



† HIST 206 may be substituted for HIST 204 and 205 plus one additional elective unit.

• To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

EDUCATION DEPARTMENT

Department Head (Acting), John B. Connely

Donald Cheek
Leonard Davidman
Erland G. Dettloff
Howard Drucker
Edward J. Ernatt
Margaret Glaser

Carolyn Hansen
Jack B. Jones
Richard V. Jones
Robert L. Levison
Donald K. Maas
Susan L. McBride

Dennis M. Nulman
Louis D. Pippin
Marilynn F. Rice
David J. Sanchez
Bernard A. Troy
Joyce P. Webb

The Education Department offers professional course work which enables a student to complete his or her preliminary or clear credential in a single subject waiver program (a secondary credential) or the multiple subject waiver program (an elementary credential). For specific single subject waiver 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.

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. In addition to such specialist and service credentials, it is possible to pursue a Master of Arts degree in Education with Specializations in Administrative Services, Counseling and Guidance, Curriculum and Instruction, Reading, Special Education, and the Special Interest Option. The Special Interest Option can be designed to meet a variety of student needs. See *Graduate Studies Announcements* for further details or contact the Education Department.



In addition to its more general programs, the Education Department also provides for the preparation of persons to teach vocational subjects in the schools and for advisement for the Bachelor of Vocational Education Degree. Instruction is given in the administrative and supervisory phases of vocational education.

A bilingual emphasis program is available for those who desire their course work to entail preparation in the Spanish language.

The Education Department operates a Reading Clinic in conjunction with its Reading Specialist preparation. The Reading Clinic 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.

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

LIBERAL STUDIES

Interdisciplinary Program
Coordinator (Acting), Margaret Glaser

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 noncredentialed 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 (2.5 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
Natural History (BIO 127, 128, 129)	3	3	3
Algebra (MATH 113)	3		
English Composition (ENGL 114, 115)	4	4	
Introduction to Genres (ENGL 204) or Introduction to Literature (ENGL 207)			4-3
Principles of Speech (SP 200)			3
Cultural Anthropology (ANT 201)		3	
American and California Government (POLS 201)		3	
General Psychology (PSY 201 or 202)			3
Topics in California History (HIST 385)			3
Introduction to Sociology (SOC 105)	3		
Music Fundamentals—Applied (MU 100)	3		
Fundamentals of Drawing (ART 101) or Introduction to Crafts (ART 141)		3	
	16	16	15-16
Sophomore			
Structure and Behavior of Matter (PSC 101, 102)	4	4	
The Physical Environment: Earth and the Universe (PSC 103) or Earth and Space Science (PSC 303)			4
Children's Literature (ENGL 260)		3	
Oral Interpretation: Children's Literature (SP 310)		3	
Global Geography (GEOG 308)			3
American Democracy and World Affairs (HIST 206)	5		
Survey of Economics (ECON 201)			3
Introduction to Art Materials (ART 104)	3		
Introduction to Art (ART 111)		3	
Voice and Articulation (SP 206) or Phonetics (SP 306)			3
Traditional Logic (PHIL 221) or Modern Logic (PHIL 222)			3
Children's Theatre (TH 347)		3	
Health Education (PE 250)	2		
Physical Education activity	1		
	15	16	16
Junior—Noncredentialed Emphasis			
Modern Elementary Math (MATH 327, 328, 329)	3	3	3
Restricted elective from AG 301/ENGR 301/CSC 410	3		
Contemporary Grammar and Composition (ENGL 392)	4		

	F	W	S
* Political Science or Geography elective (300–400 level)		3	
* PSY/SOC/ANT elective from approved list			3
Restricted elective			3
Political Science or Sociology elective (300–400 level)	3		
* Literature elective (ENGL 300–400 level)		4	
Music for Children (MU 301)		3	
Music Appreciation (MU 204) or Ethnic Music of the World (MU 208)	3		
* Philosophy elective from approved list		3	
Electives			5–6
	16	16	14–15

Junior—Credential

Modern Elementary Math (MATH 327, 328, 329)	3	3	3
Restricted elective from AG 301/ENGR 301/CSC 410	3		
Contemporary Grammar and Composition (ENGL 392)	4		
Music Appreciation (MU 204) or Ethnic Music of the World (MU 208)	3		
Learning Processes (ED 335)			3
Music for Children (MU 301)		3	
* Literature elective (ENGL 300–400)		4	
* Political Science or Geography elective (300–400 level)		3	
* Philosophy elective from approved list		3	
Curriculum and Methods in Elementary School Reading (ED 434)			2
Diagnosis, Prescription, and Evaluation (ED 436)			2
* PSY/SOC/ANT elective from approved list			3
Political Science (300–400) or Sociology (300–400)	3		
	16	16	13

Senior—Noncredential Emphasis

Communication in Children's Environments (SP 406)	4		
Foreign Language electives	5	5	5
† Restricted electives	3	6	10
Senior Project (HUM 461)	3		
Electives		4	
	15	15	15

Senior—Credential

Methods of Teaching Reading (ED 435)		3	
Student Teaching (ED 430, 440)		6	12
Organizing and Teaching Multiple Subjects (ED 424)		3	
Instructional Processes (ED 438)	3		
Senior Project Practicum (ED 451)			3
Multicultural Education (ED 301)	3		
Communication in Children's Environments (SP 406)	4		
Electives	6	3–4	
	16	15–16	15

* To be selected in accordance with General Education—Breadth requirements. (See adviser or department office.)

† Two emphases of at least 18 units each 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.

PHYSICAL EDUCATION DEPARTMENT

Department Head, Jimmy H. Railey

Doris Acord	William R. Hicks	Andrew J. Proctor
Richard A. Anderson	Vaughan Hitchcock	Carolyn Shank
Katharine Barthels	Lynn Jamieson	Mary L. Stallard
Victor A. Buccola	Thomas J. Lee	Moon Ja Minn Suhr
F. Stuart Chestnut	Robert E. Meyers, Jr.	James L. Webb
F. Sheldon Harden	Ray Nakamura	Marylinda Wheeler
Dwayne G. Head		

The Physical Education Department offers undergraduate degree programs in physical education and recreation administration and a graduate degree program in physical education.

Options in teaching, athletic coaching, and health education are offered in the undergraduate degree program. An approved program of courses is available to those seeking an Adapted Physical Education Emphasis 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 programs, and the armed forces.

The undergraduate curriculum for recreation administration offers professional preparation service in various agencies and organizations, university unions, schools, the armed forces, corporations, correctional institutions, and health organizations. A concentration in therapeutic recreation emphasizes recreation therapy, leisure education for the disabled, and special recreation.

The Physical Education Department also contributes to the general education needs of all students through provision of physical education activity courses.

Because of an ideal geographical location and outstanding physical education facilities, the University has become a center for workshops held by the health and physical education organizations of the State.

Extensive outdoor facilities include a number of turfed areas for physical education classes and intramural sports activities. A football stadium, regulation baseball diamond with permanent stands and quarter-mile track provide outstanding facilities for intercollegiate athletic teams. An additional track is available for instructional and intramural activities. Basketball, volleyball, handball, shuffleboard, tennis courts with outdoor lighting and a competitive swimming pool are used for instruction and student recreation.

The Physical Education Building provides excellent facilities for all phases of the total physical education and intercollegiate athletic program. 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 a human performance laboratory.

Crandall Gym also provides facilities for dance, swimming and gymnastics.

CURRICULUM IN PHYSICAL EDUCATION

Freshman	F	W	S
Freshman Composition (ENGL 114, 115)	4	4	
Mathematics (MATH 114)	3		
Health Education (PE 250)			2
Professional activity series (PE 206-229)		2	2
* Physical Science elective		3	
* Anthropology or Sociology elective.....			3
General Zoology (ZOO 131)	4		
Introduction to Physical Education (PE 270).....	2		
History and Philosophy of Physical Education (PE 274)		3	
Survey of Economics (ECON 201)			4

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Safety and First Aid (PE 280)	2		
Principles of Speech (SP 200)		3	
American and California Government (POLS 201)			3
Electives and courses to complete major	<u>2</u>	<u>1</u>	<u>3</u>
	17	16	17
Sophomore			
Aquatics (PE 218)		2	
Elementary Probability and Statistics (STAT 211)	3		
Statistical Methods (STAT 212)		3	
Professional activity series (PE 206-229)		2	
General Psychology (PSY 201 or 202)	3		
Tumbling-Vaulting (PE 206) or Apparatus (PE 207)			2
U.S. and World Affairs (HIST 205)			3
Growth of American Democracy (HIST 204)		3	
Human Anatomy and Physiology (ZOO 237, 238, 239)	3	3	3
Beginning Athletic Training (PE 252)	2		
Nutrition (HE 210)			3
Electives and courses to complete major	<u>6</u>	<u>3</u>	<u>6</u>
	17	16	17
Junior			
Advanced Composition (ENGL 300)		3	
Human Muscle Anatomy (ZOO 340)	2		
* Social, Political or Economic Institutions elective (from approved list)	3		
Kinesiology (PE 302)		3	
Introduction to Dance (PE 244)		3	
Physiology of Exercise (PE 303)			3
Tests and Measurements (PE 319)	3		
Introduction to Motor Learning (PE 402)		3	
* Literature elective			3
Introduction to Art Materials (ART 104), Acting (TH 320) or Music elective			3
Electives and courses to complete major	<u>8</u>	<u>5</u>	<u>8</u>
	16	17	17
Senior			
Adaptive Physical Education (PE 406)			3
Senior Project (PE 461, 462)	2	2	
Organization and Administration of Health and Physical Education (PE 401)	3		
Ethics (PHIL 331)	3		
* Literature or Philosophy elective		3	
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
Electives and courses to complete major	<u>9</u>	<u>8</u>	<u>9</u>
	17	16	15

ATHLETIC COACHING OPTION

(Add courses below to basic curriculum)

Junior	Senior
† With adviser approval (REC 105, PSY 302 or coaching theory courses)	PE 410 Psychology of Coaching
PE 278, 290, 292, 294, 297, 298 Officiating	PE 432 Athletic Training and Rehabilitation
(3)	PE 437 Directed Field Work
	JOUR 312 Public Relations
	(3)

* Courses to be selected in accordance with General Education-Breadth requirements. (See adviser or department office)

† Coaching theory courses to be recommended by adviser.

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HEALTH EDUCATION OPTION
(Add courses below to basic curriculum)

Freshman	Junior
PE 254 School Health Program..... (2)	BIO 301 Human Ecology (3)
CD 108 Child, Family, and Community or SOC 206 The Sociology of Family Life..... (3)	PSY 301 Psychology of Personal Devel- opment..... (3)
	PSY 303 Human Sexuality (2)
	SOC 344 Sociology of Poverty..... (3)
Sophomore	Senior
BIO 253 Orientation to the Health Professions (1)	PSY 320 Behavioral Effects of Drugs and Alcohol (3)
BACT 221 General Bacteriology..... (4)	BIO 302 Human Inheritance (3)
GEOG 320 Geography of Hunger (3)	PE 405 Administration of Health Educa- tion (2)
	CD 447 Adulthood and Aging (3)

TEACHING OPTION
(Add courses below to basic curriculum)

Freshman	Junior
PE 206-229 Professional Activity Series (2)	PE 332 Elementary School PE..... (3)
	PE 312, 356, 358, 379, 381, 383 Teaching Methods..... (9)
Sophomore	PE 375 Teaching Team and Individual Sports..... (3)
PE 206 Tumbling and Vaulting or PE 207 Apparatus (2)	PE 424 Organization and Teaching PE (3)
PE 260 Intramural Sports (3)	
PE 278, 290, 292, 294, 297, 298 Officiating (1)	
PE 296 Planning Techniques in Physical Education (3)	Senior
	PE 440 Activity Supervision (3)

CERTIFICATE PROGRAMS/INDIVIDUALIZED COURSE OF STUDY

Students may pursue preparation for other physical education careers 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
Introduction to Recreation and Leisure Services (REC 101)	3		
Outdoor Recreation Skills (REC 103)	2		
Recreation Leadership (REC 105)			3
Natural History: Animal Communities (BIO 128)	3		
Science and Society (PSC 171).....		3	
Basic Accounting (ACTG 131)			3
Physical Science elective		3	
Business Enterprise (BUS 101)			4
English Composition (ENGL 114)	4		
Advanced Lifesaving (PE 143)	1		
Introduction to Sociology (SOC 105).....		3	
Introduction to College Math (MATH 109).....		3	
*† Life Science and Physical Science electives.....	3		3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
Electives		2	
	16	17	16

† Therapeutic Recreation students take CHEM 106 (3), and ZOO 131 (4) as concentration prerequisites.

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
Sophomore			
Programming for Leisure (REC 210)			3
Recreation for People with Disabling Limitations (REC 252)		4	
Business Law Survey (BUS 201)	3		
Advanced Composition (ENGL 300)		3	
Physical Geology (GEOL 201)	3		
Health Education (PE 250)		2	
Intramural Sports (PE 260)	3		
Safety and First Aid (PE 280)			2
Water Safety (PE 284)		1	
American and California Government (POLS 201)			3
General Psychology (PSY 201 or 202)			3
Principles of Speech (SP 200)			3
* Art or Theatre elective	3		
Modern Logic (PHIL 222)		3	
Electives	3	2	3
	15	15	17
Junior			
Supervisory Roles in Recreation Administration (REC 323)	3		
Organizational Patterns of Recreation Administration (REC 324)	3		
Implementation of Outdoor Recreation Programs (REC 337)			3
Commercial Recreation and Leisure Services (REC 364)		3	
* Literature elective (300-400 course) from approved list	3		
Growth of American Democracy (HIST 204)	3		
United States in World Affairs (HIST 205)		3	
Introduction to Public Administration (POLS 214)		3	
Survey of Economics (ECON 201)			3
* Philosophy elective (from approved list)			3
* Literature or Philosophy elective (from approved list)		3	
† Electives	3	3	6
	15	15	15
Senior			
Research in Recreation Administration (REC 369)	3		
Management of Recreation and Leisure Services (REC 424)		3	
Directed Field Experience (REC 430, 431)	3		3
Senior Project (REC 461)		3	
Leisure Counseling (REC 457)	3		
Social Psychology (PSY 401)		3	
Introduction to Conservation (CONS 311)	3		
Public Relations (JOUR 312)			3
Park Planning and Management (OH 337)		4	
Urban Sociology (SOC 313)			3
† Electives	3	2	6
	15	15	15

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

† Minimum of 15 units must be 300-400 series.

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CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

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

Required:	<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
	<hr style="width: 100%;"/>
	12
Select 9 units with adviser approval from the following:	
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
	<hr style="width: 100%;"/>
	9
Additional Physical Education electives:	
A minimum of nine additional graduate level units must be taken in Physical Education.....	9
Electives:	
A maximum of fifteen units may be taken outside the Physical Education Department in 300, 400, and 500 level courses. Up to nine units may be taken at the 300, 400 level. Nine units of adviser approved 400 level Physical Educa- tion courses may be taken.	<hr style="width: 100%;"/>
	15
	<hr style="width: 100%;"/>
	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 and other subjects.



PSYCHOLOGY DEPARTMENT

Department Head, L. Robert Sorensen

William D. Curtis
M. Dale Federer

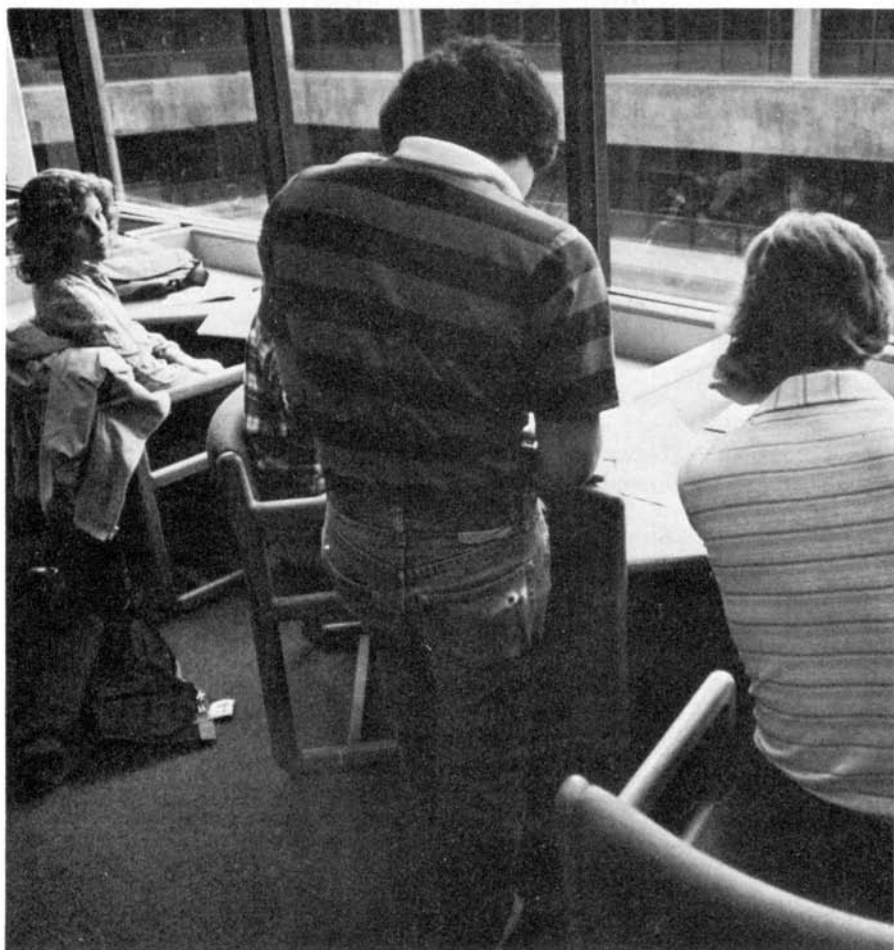
Daniel Hawthorne
Linden L. Nelson

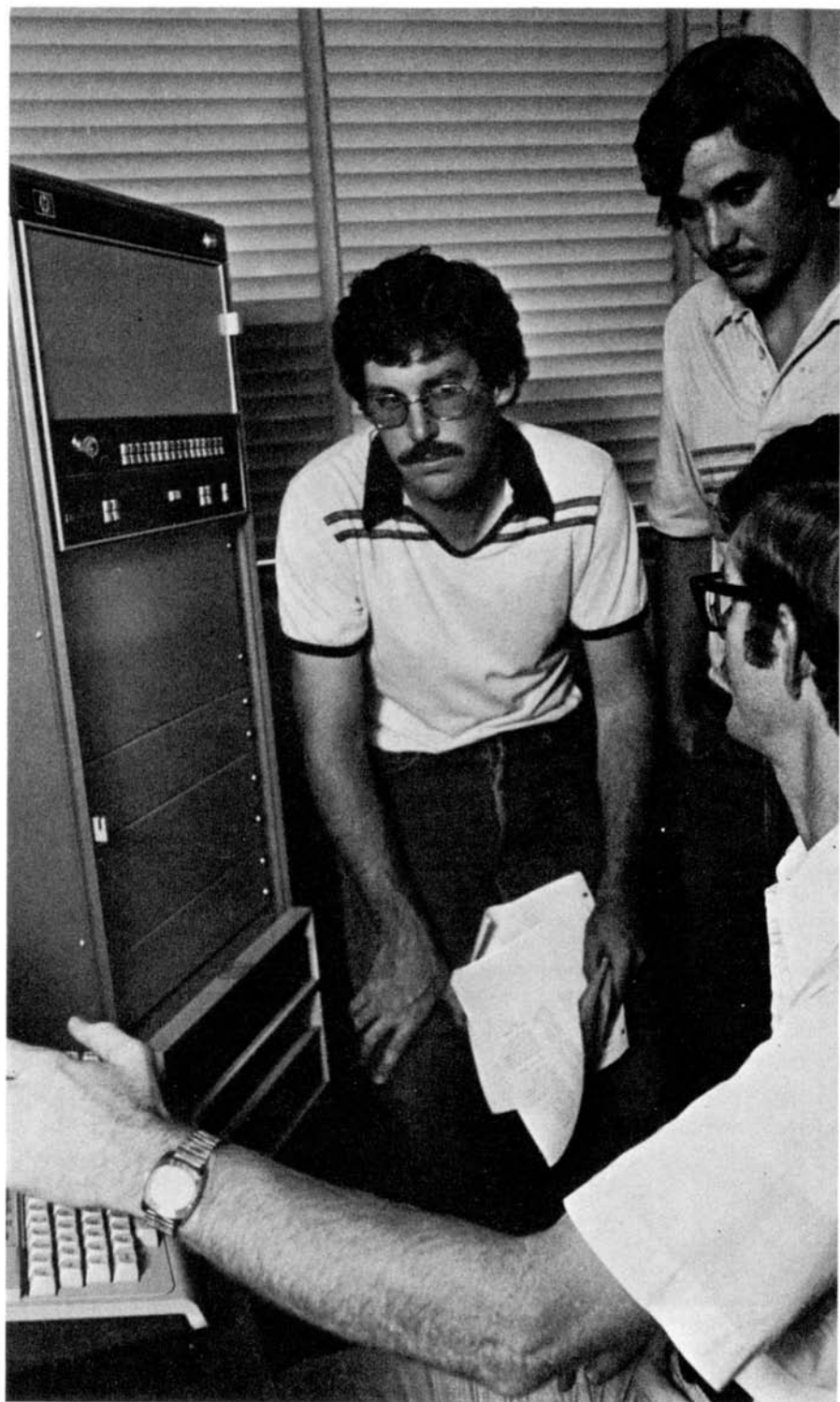
Peter Rabe
Charles M. Slem

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

<i>Degree Program</i>	<i>Page</i>
B.S. Biological Sciences	205
B.S. Environmental and Systematic Biology	207
B.S. Microbiology	208
B.S. Chemistry	211
B.S. Biochemistry	213
B.S. Computer Science	214
B.S. Statistics	216
B.S. Mathematics	219
B.S. Physics	223
B.S. Physical Science.....	224
M.S. in Biological Sciences	210
M.S. in Chemistry	212
M.S. in Computer Science.....	217
M.S. in Mathematics	220

SCHOOL OF SCIENCE AND MATHEMATICS

William C. Langworthy, Dean
Philip S. Bailey, Associate Dean

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, Science and Mathematics and Social Sciences 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, John K. Hampton, Jr.

Frederick P. Andoli	Randolph L. Grayson	Maria E. Ortiz
Paraschos Babos	V. L. Holland	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. Gambro	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 rapidly expanding 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.

	F	W	S
Freshman			
General Botany (BOT 121, 122, 123) or General Zoology	4	4	4
General Chemistry (CHEM 127, 128, 129)	4	4	4
Survey of Organic Chemistry (CHEM 226)			4
* Anthropology or Sociology elective.....	3		
English Composition (ENGL 114, 115)		4	4
¹ College Algebra and Trigonometry (MATH 120).....	5		
* Social, Political, Economic Institutions elective		3	
	16	15	16
Sophomore			
General Zoology (ZOO 131, 132, 133) or General Botany	4	4	4
General Bacteriology (BACT 221)	4		
Principles of Speech (SP 200)		3	
College Physics (PHYS 121, 122, 123)	4	4	4
General Psychology (PSY 201 or 202)		3	
* Physical Education or Psychology elective			2
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)			3
** Electives and courses to complete major	5	3	4
	17	17	17
Junior			
General Ecology (BIO 325)	3		
Genetics (BIO 303)	3		
Advanced Composition (ENGL 300) or Writing for Scientific Journal (ENGL 318)		3-4	
American and California Government (POLS 201)	3		
² Computer and Computing (CSC 110).....		3	
* Literature elective	3		
* Philosophy elective		3	
* Art, Music or Theatre elective			3
Senior Project (BIO 461).....			2
Biochemistry (CHEM 328).....		4	
General Entomology (ENT 326).....			4
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective			3
** Electives and courses to complete major	5	3-4	5
	17	17	17
Senior			
Physiology I: General (BIO 431).....	4		
Senior Project (BIO 462).....		2	
Undergraduate Seminar (BIO 463)			2
General Cytology (BIO 423)	4		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives	3	3	
** Electives and courses to complete major	5	9	11
	16	17	16

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

¹ MATH 118-119 will substitute, or MATH 141 and any additional course in CSC, MATH, or STAT.

² CSC 101 will substitute.

** Of the total elective units 18 shall be chosen in a field of concentration in the Biological Sciences with adviser approval.

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.

	F	W	S
Freshman			
General Zoology (ZOO 131, 132, 133)	4	4	4
* General Chemistry (CHEM 121, 122)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
English Composition (ENGL 114, 115)		4	4
† College Algebra and Trigonometry (MATH 120)	5		
Elementary Probability and Statistics (STAT 211)		3	
Computers and Computing (CSC 110)			3
Soils (SS 121)	4		
‡ General Education restricted elective			2
	<u>17</u>	<u>15</u>	<u>17</u>
Sophomore			
General Botany (BOT 121, 122, 123)	4	4	4
Vertebrate Field Zoology (ZOO 329)			4
§ Introductory Physics (PHYS 104)	4		
Physical Geology (GEOL 201)		3	
Physical Geography (GEOG 250)			4
** Economics elective	3		
** Anthropology or Sociology elective		3	
** Literature elective		3	
** Philosophy elective	3		
** ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
†† Electives	3		
	<u>17</u>	<u>16</u>	<u>15</u>
Junior			
Genetics (BIO 303)	3		
Evolution (BIO 315)		3	
General Ecology (BIO 325)	3		
Plant Ecology (BOT 326)			4
General Entomology (ENT 326)	4		
Field Botany (BOT 333)			4
Principles of Speech (SP 200)		3	
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3

* CHEM 127, 128, 129 and CHEM 328 are recommended for students planning postgraduate training.

† MATH 118, 119 will substitute, or MATH 141 and any additional course in CSC, MATH or STAT.

‡ General Education electives (5 units) to be selected from the following: BIO 301, 302; HE 210; PE 100-165 (limit 2 units PE activity), 250, 303; PSY 201, 202, 303, 304, 311, 320, 401; SOC 310; ZOO 238, 239, 432, 433.

§ PHYS 121, 122, 123 are recommended substitute for students planning postgraduate training.

** To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

†† Of the total elective units, 6 must be selected from each of the two specified lists; additional information available from the department.

	F	W	S
* Literature or Philosophy elective.....		3	
‡ Electives	3	3	4
	16	15	15
Senior			
Physiology I: General (BIO 431).....	4		
Animal Behavior (ZOO 437)	4		
Senior Project (BIO 461).....	2		
* Art, Music or Theatre elective		3	
* General Education restricted elective			3
ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
‡ Electives	6	10	9
	16	16	15

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

Medical Laboratory Technology

This option prepares students specifically for careers in medically oriented fields: Immunology, medical bacteriology, medical mycology, virology, parasitology, hematology, and genetics.

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.

Freshman	F	W	S
General Zoology (ZOO 131, 132) or General Botany (BOT 121, 122)	4	4	
General Chemistry (CHEM 127, 128, 129)	4	4	4
¹ College Algebra and Trigonometry (MATH 120).....			5
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Freshman Composition (ENGL 104, 105).....	3	3	
American and California Government (POLS 201)	3		
* Social, Political, Economic Institutions elective			3
Physical Education or Psychology electives.....	1	1	
	15	15	15

Sophomore

General Botany (BOT 121, 122) or General Zoology (200, 131, 132) ..		4	4
² Survey of Organic Chemistry (CHEM 226)	4		
General Microbiology (BACT 224, 225)	4		4
College Physics (PHYS 121, 122, 123)	4	4	4

‡ Of the total elective units, 6 must be selected from each of two specified lists; additional information available from the department.

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

¹ MATH 118-119 will substitute or MATH 141 and any additional course in CSC, MATH, or STAT.

² CHEM 316-317 will substitute for CHEM 226. (Substitution strongly recommended for students in the General Microbiology Option.)

	F	W	S
* Literature elective			3
* Art, Music, or Theatre elective.....	3		
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)		3	
Electives and courses to complete major		4	
	<hr/> 15	<hr/> 15	<hr/> 15

Junior

Quantitative Analysis (CHEM 331)	5		
³ Biochemistry (CHEM 371)	4		
Genetics (BIO 303)		3	
Physiology I: General (BIO 431)		4	
General Virology (BACT 402)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective		3	
General Psychology (PSY 201, 202)			3
Principles of Speech (SP 200)	3		
Modern Logic (PHIL 222)			3
Electives and courses to complete major	5	7	8
	<hr/> 17	<hr/> 17	<hr/> 17

Senior

Serology and Immunology (ZOO 426)	4		
Medical Microbiology (BACT 432)		4	
Bacterial Cytology and Physiology (BACT 424)			4
Senior Project (BIO 461)	2		
Philosophy elective	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
* Anthropology or Sociology elective.....		3	
Electives and courses to complete major	7	7	9
	<hr/> 16	<hr/> 17	<hr/> 16

MEDICAL LABORATORY TECHNOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

Sophomore

BIO 321 Biological Instrumentation .. (3)	CHEM 377 Chemistry of Drugs and Poisons..... (3)
Junior and Senior Years	CHEM 335-6 Quantitative Physiologi- cal Chemistry
BACT 430 Medical Mycology	(7)
BIO 304 Molecular Genetics (2) or	ZOO 425 Parasitology
BIO 255 Microtechnique (2) or	ZOO 428 Hematology
BIO 253 Orientation to Health Profes- sions (1,1) or BIO 462 Senior Project (2) or BACT 403 General Virology	ZOO 412 Introduction to Clinical Pa- thology..... (3)
Lab	(2)

GENERAL MICROBIOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

Junior and Senior Years

BACT 333 Industrial Microbiology (4)	BIO 423 General Cytology..... (4)
BACT 342 Sanitary Microbiology (4)	BIO 463 Undergraduate Seminar (2)
BACT 421 Food Microbiology	CHEM 372 General Biochemistry II.. (3)
BACT 436 Microbial Ecology	CHEM 373 General Biochemistry III (3)
	CHEM 374 Biochemistry Laboratory .. (2)

³ CHEM 328 may be substituted for Medical Technology Option only.

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE

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

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 $22\frac{1}{2}$ 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.

	<i>Units</i>
Courses in the biological sciences selected from 300, 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
Seminar in Biology (BIO 590)	3
Thesis (BIO 599) or additional course work with comprehensive examination	9
Electives from 300, 400 and 500 level courses	6
	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	Jerome F. Houlis	Dennis R. Phillips
Christina A. Bailey	Ralph A. Jacobson	Michael G. Silvestri
Philip S. Bailey	Dane R. Jones	Jan W. Simek
Albert C. Censullo	James Y. Katekaru	Russell L. Tice
Robert S. Cichowski	David L. Keeling	Howard D. Walker
Lee Charles Coombs	Martin A. Kellerman	James D. Westover
Charles E. Dills	Bruce Kennelly	Hewitt G. Wight
Norman L. Eatough	William C. Langworthy	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's degree in chemistry or biochemistry, and the master's 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, 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
General Chemistry (CHEM 127, 128, 129)	4	4	4
General Chemistry Laboratory (CHEM 156)			1
Written Communications (ENGL 104 or 114, 218, 219, 310, 318)	3	3	
Oral Communication (SP 200, 201, 217, 250, 305)			3
Analytic Geometry and Calculus (MATH 141, 142, 143) or Technical Calculus (MATH 131, 132, 133)	4	4	4
* Physiological/Social/Psychological elective	1	1	
Computers and Computing (CSC 110)			3
* Life Science elective (BIO 101, BOT 121, or ZOO 131)		3-4	
Electives	2-3		
	14-15	15-16	15

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

212 Chemistry

	F	W	S
Sophomore			
Quantitative Analysis (CHEM 331)	5		
Organic Chemistry (CHEM 316, 317, 318)	4	5	5
General Physics (PHYS 131, 132, 133)	4	4	4
Mathematics (MATH 241, 242) or STAT or CSC courses		4	4
Chemical Literature (CHEM 253)		1	
Survey of Economics (ECON 201)			3
Restricted Elective SP 215, 304; ENGL 105, 115, 326; PHIL 221, 222 ..	3		
** Electives		2	
	16	16	16
Junior			
† Approved Chemistry electives	3	4	
Physical Chemistry (CHEM 305, 306, 307)	3	3	4
Physical Chemistry Laboratory (CHEM 355, 356)	1	1	
Physics elective (200 and above)	3		
Literature elective			3
ART, MU, TH elective	3		
American and California Government (POLS 201)			3
* ART/FOR LANGS/HUM/LIT/MU/PHIL electives	5		
General Psychology (PSY 201 or 202)		3	
* Social/Political/Economic Institutions elective		5	
** Electives			2
	15	16	15
Senior			
Instrumental Analysis (CHEM 439)	4		
Senior Project (CHEM 461)		2	
Inorganic Chemistry (CHEM 481)		3	
Undergraduate Seminar (CHEM 459)	2		
† Approved Chemistry elective	4	5	4
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
Philosophy elective	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL elective			3
Electives	3	3	5
	16	16	15

CURRICULUM FOR MASTER OF SCIENCE DEGREE IN CHEMISTRY

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

Required:	<i>Units</i>
500 level Graduate courses in Chemistry	18
CHEM 590 Graduate Seminar	3
CHEM 599 Thesis, or additional courses if nonthesis option is chosen	6
Additional courses at 300, 400 or 500 level:	
Twelve units from the Chemistry Department and six units outside the Chemistry Department	18
	45

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

** May not be taken as a science or mathematics elective for General Education-Breadth requirements.

† 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 360.

b. CHEM 405, 419, 444, 457, 458, 462, 482, 500-level courses.

CURRICULUM IN BIOCHEMISTRY

	F	W	S
Freshman			
General Chemistry (CHEM 127, 128, 129)	4	4	4
Written Communication (ENGL 104 or 114)	3-4		
Oral Communication (SP 200, 201, 217, 250, 305)			3-4
Technical Calculus (MATH 131, 132, or 141, 142)	4	4	
College Physics (PHYS 121, 122)		4	4
Life Science (BOT 121, ZOO 131, or BACT 221)		4	
* Computers and Computing (CSC 110)			3
† Physiological/Social/Psychological elective	1		1
** Electives	3		
	15-16	16	15-16
Sophomore			
Quantitative Analysis (CHEM 331)			5
Organic Chemistry (CHEM 316, 317)	4	5	
‡ Chemistry elective			5
College Physics (PHYS 123)	4		
† Literature elective	3		
† Philosophy elective		3	
American and California Government (POLS 201)			3
Written Communication (ENGL 218, 219, 310, or 318)		3	
Survey of Economics (ECON 201)		3	
† Life Science electives	3		
Chemical Literature (CHEM 253)		1	
Critical Thinking (SP 215, 304; ENGL 105 or 115, 326; PHIL 221, 222)			3
** Electives	2		
	16	15	16
Junior			
General Biochemistry (CHEM 371, 372, 373)	4	3	3
Biochemistry Laboratory (CHEM 374)			2
§ Biophysical Chemistry (CHEM 301, 302)	3	4	
Growth of American Democracy (HIST 204)	3		
U.S. in World Affairs (HIST 205)		3	
† ART/FORLANGS/HUM/LIT/MU/PHIL electives			5
† Art, Music or Theatre elective	3		
† Social/Political/Economic Institutions elective	2	2	
General Psychology (PSY 201 or 202)		3	
Electives	1	1	6
	16	16	16
Senior			
‡ Chemistry electives	3	3	3
Senior Project (CHEM 461)		2	
Undergraduate Seminar (CHEM 459)	2		
* ART/FOR LANGS/HUM/LIT/MU/PHIL electives	2		
Electives	8	10	12
	15	15	15

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

* CSC 101 will substitute.

† To be selected in accordance with General Education Breadth requirement. (See adviser or department office.)

** May not be taken as a science or mathematics elective for General Education—Breadth requirements.

‡ Chemistry elective chosen from CHEM 307, 318, 332, 439, 457.

§ CHEM 305, 306, 355 will substitute.

† CHEM 156, 252, 300, 400, and 500 level courses (except 328).

COMPUTER SCIENCE AND STATISTICS DEPARTMENT

Department Head, Emile E. Attala

Jay S. Bayne	Joseph E. Grimes	Roxly L. Peck
James L. Beug	John E. Groves	John M. Rogers
Raymond E. Boche	Reino Hannula	Joseph C. Sharp
James C. Daly	Roy B. Hollstien	Robert K. Smidt
Jay L. Devore	John Y. S. Hsu	Daniel F. Stubbs
Robert H. Dourson	Elmo A. Keller	Neil W. Webre
Bernard B. Evans	Sham S. Luthra	Patrick O. Wheatley
Thomas A. Foley	Y. Leon Maksoudian	Sing-Chou Wu

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 by the computer industry 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. As a supplement to all the computing equipment maintained by the computer center, the department maintains for student use a calculating machine laboratory equipped with modern electrical and electronic calculators.

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
Fundamentals of Computer Science (CSC 118)	3		
Advanced Fortran Programming (CSC 201)			3
Computer Principles and Programming (CSC 221)		3	
Digital Computer Symbolic Programming (CSC 222)			3
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
Modern Logic (PHIL 222)	3		
General Chemistry (CHEM 124)		4	
* Anthropology or Sociology elective.....			3

* To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

	F	W	S
American Democracy (HIST 204)	3		
English Composition (ENGL 114)		4	
Electives	<u>3</u>		<u>4</u>
	16	15	17
Sophomore			
Linear Programming (CSC 219)	3		
Logic and Switching Circuits (EL 219)			3
* Mathematics of Matrices (MATH 204) <i>or</i> Analytic Geometry and Calculus (MATH 241)	3-4		
Discrete Structures (CSC 245)		3	
* Differential Equations (MATH 242)		0-4	
* Numerical Linear Analysis (CSC 331) <i>or</i> Numerical Analysis I (CSC 332)			3
Statistical Analysis (STAT 321, 322)		3	3
General Physics (PHYS 131, 133)	4	4	
† Art, Music, or Theatre elective	3		
American and California Government (POLS 201)	3		
U.S. in World Affairs (HIST 205)			3
Physical Education elective		2	
Electives	<u>1</u>	<u>4-0</u>	<u>4</u>
	17-18	16	16
Junior			
Data Structures (CSC 345)	3		
Introduction to Digital Computer Architecture (CSC 304)		3	
File Management (CSC 346)			3
Programming Languages (CSC 351)		4	
Computer Systems Programming (CSC 353)			3
Principles of Economics (ECON 211, 212)	3	3	
Report Writing (ENGL 218)			3
† Life Science elective	3		
§ Computer Science electives	3	3	6
† Literature elective (300-400 level)	3		
† Philosophy elective (300-400 level)		3	
† Literature or Philosophy elective (300-400 level)			<u>3</u>
	15	16	18
Senior			
Compilers and Interpreters (CSC 451)	3		
Introduction to Operating Systems (CSC 453)		3	
Senior Project (CSC 461, 462)	2	2	
Undergraduate Seminar (CSC 463)			2
Public Speaking (SP 200)			3
General Psychology (PSY 201)		3	

* Students choosing sequence (b) or (e) below take MATH 241, 242, CSC 332; others take MATH 204, CSC 331.

† To be selected in accordance with General Education-Breadth requirements. (See adviser or department office.)

§ Complete two of the following sequences:

- a) EL 305, 319, 407, and 404 or 408
- b) EL 319, 350, 419, and IE 430
- c) CSC 203, 440, 446 and two 300/400 courses in BUS, ACTG, or MKTG
- d) STAT 323, 324, 330 and 423
- e) CSC 333, 431, 455, MATH 318
- f) CSC 306, 309, 404, 409.

216 Computer Science and Statistics

	F	W	S
* ART/FOR LANGS/HUM/LIT/MU/PHIL/electives	3		3
§ Computer Science electives	6	3-6	3
Electives	<u>3</u>	<u>7-4</u>	<u>6</u>
	17	18	17

CURRICULUM IN STATISTICS

Freshman

Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
Fortran Programming (CSC 101)	2		
English Composition (ENGL 114)	4		
Report or Technical Writing (ENGL 218)		3	
General Physics (PHYS 131)		4	
General Biology (BIO 101)			3
Modern Logic (PHIL 222)			3
Physical Education elective		2	
† Electives	<u>6</u>	<u>3</u>	<u>6</u>
	16	16	16

Sophomore

Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Statistical Analysis (STAT 321, 322)		3	3
Advanced Fortran (CSC 201)	3		
Principles of Economics (ECON 211, 212)	3	3	
* Physical Science or Life Science elective			4
Principles of Speech (SP 200)			3
Genetics (BIO 303)			3
* Anthropology or Sociology elective.....	3		
* Art, Music, or Theatre elective.....		3	
† Electives	<u>3</u>	<u>3</u>	<u>3</u>
	16	16	16

Junior

Statistical Analysis (STAT 323)	3		
Statistical Use of Computers (STAT 330)		3	
Applied Regression Analysis (STAT 324)			3
Sampling Techniques (STAT 421)			3
Numerical Nonlinear Analysis (CSC 332)			3
Linear Programming (CSC 219)		3	
Linear Algebra (MATH 312)		4	
Math Optimization or Game Theory (MATH 431 or 437)	3		
* Literature elective (300-400 level)	3		
* Philosophy elective (300-400 level)		3	
* Literature or Philosophy elective (300-400 level)			3
American and California Government (POLS 201)		3	
Growth of American Democracy (HIST 204)			3
† Electives	<u>8</u>	<u>1</u>	<u>2</u>
	17	17	17

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† At least 15 units must be selected with the approval of the adviser in one field in which statistics is applied.

§ Complete two of the following sequences.

- a) EL 305, 319, 407, and 404 or 408
- b) EL 319, 350, 419, and IE 430
- c) CSC 203, 440, 446 and two 300/400 courses in BUS, ACTG, or MKTG
- d) STAT 323, 324, 330 and 423
- e) CSC 333, 431, 455, MATH 318
- f) CSC 306, 309, 404, 409.

Senior	F	W	S
Probability Theory and Applications I (STAT 425)	3		
Probability Theory and Applications II (STAT 426)		3	
Mathematical Statistics (STAT 427)			3
Nonparametric Methods in Statistics (STAT 415)	3		
Design of Experiments (STAT 423)		3	
Senior Project (STAT 461, 462)	2	2	
Undergraduate Seminar (STAT 463)			2
Systems Analysis (CSC 350)	3		
U.S. in World Affairs (HIST 205)	3		
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives			6
General Psychology (PSY 202)		3	
† Electives	3	6	6
	17	17	17

CURRICULUM FOR MASTER OF SCIENCE DEGREE IN COMPUTER SCIENCE

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

The student must take at least 45 units of work beyond the undergraduate degree chosen to include:

	<i>Units</i>
I. A core sequence of required graduate courses:	
CSC 541-542 Information Processing	8
CSC 551-552 Computer Systems and Software	8
CSC 559-560 Practicum in Computer Science (I) (II)	6
CSC 590 Seminar in Computer Science	3
	25
II. A pool of suitable elective courses to complete the required 45 units. Suggested courses include:	
CSC 404 Telecommunications and Distributed Systems	3
CSC 409 Microcomputer Systems	3
CSC 440 Computer Based System Development	4
CSC 454 Operating System Implementation	3
CSC 455 Computer Graphics	3
CSC 519 Computer Modeling and Simulation I	4 and
CSC 520 Computer Modeling and Simulation II	4
CSC 531 Numerical Solution of Algebraic Systems	4 and
CSC 532 Numerical Solution of Differential Equations	4
CSC 570 Selected Topics in CSC	1-3
CSC 599 Thesis/Project	4-6
EL 520 Digital Systems Design	3 and
EL 521 Computer Systems	3 and
EL 522 Microprocessor-Based Digital System Design	4
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 coursework taken.	

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† At least 15 units must be selected with the approval of the adviser in one field in which statistics is applied.

MATHEMATICS DEPARTMENT

Department Head, Charles J. Hanks

Sabah Al-hadad	Donald G. Hartig	Allen D. Miller
Alfred M. Bachman	Charles T. Haskell	Kent E. Morrison
Bernard W. Banks	Alan W. Holz	Paul F. Murphy
Estelle L. Basor	J. Myron Hood	Dina N. Ng
Michael R. Colvin	Kempton L. Huehn	Thomas D. O'Neil
H. Arthur Dekleine	Rex L. Hutton	Don Rawlings
James E. Delany	Boyd Walker Johnson	Howard Steinberg
Gary M. Epstein	W. Boyd Judd	H. Bernard Strickmeier
Gerald P. Farrell	Euel W. Kennedy	Raymond D. Terry
Jack E. Girolo	Martin T. Lang	Neal R. Townsend
D. Edward Glassco	George M. Lewis	John Van Eps
Stuart Goldenberg	John J. Lowry	Ralph M. Warten
Harvey C. Greenwald	George W. Luna	Stephen T. Weinstein
Thomas E. Hale	George R. Mach	Robert S. Wolf
Adelaide T. Harmon-Elliott	Jean M. McDill	

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, 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 a student should have, 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 that 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

	F	W	S
Freshman			
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
Theory of Equations (MATH 170).....			2
Fortran Programming (CSC 101)	2		
** Physics (PHYS 131, 132).....		4	4
English Composition (ENGL 114, 115)	4	4	
* Physical Education activity or Health Education (PE 250)	2		
Electives and courses to complete major	4	4	7
	<u>16</u>	<u>16</u>	<u>17</u>
Sophomore			
Analytic Geometry and Calculus (MATH 241)	4		
***Computer Principles and Programming (CSC 221).....			3
Differential Equations (MATH 242)		4	
Methods of Proof in Mathematics (MATH 248).....	3		
Linear Algebra (MATH 312).....		4	
Statistical Analysis (STAT 321)			3
** Physics (PHYS 133)	4		
Growth of American Democracy (HIST 204).....		3	
The United States in World Affairs (HIST 205)			3
American and California Government (POLS 201)	3		
Principles of Speech (SP 200)		3	
Electives and courses to complete major	3	3	7
	<u>17</u>	<u>17</u>	<u>16</u>
Junior			
Modern Algebra (MATH 381)		4	
Statistical Analysis (STAT 322)	3		
* Literature elective		3	
* Philosophy elective			3
* Literature or Philosophy elective.....	3		
General Psychology (PSY 201 or 202)		3	
* Life Sciences elective.....			3
* Oral and written communication elective	3		
* Economics elective.....			3
* Anthropology or Sociology elective.....	3		
* Social, political and economic institutions elective		3	
Electives and courses to complete major	5	4	8
	<u>17</u>	<u>17</u>	<u>17</u>
Senior			
Advanced Calculus (MATH 412)	4		
Undergraduate Seminar (MATH 459).....	2		
Senior Project (MATH 461, 462)		2	2
* Art, Music or Theatre elective	3		
* ART, FOR LANGS, HUM, LIT, MU, PHIL and TH electives		3	3
Electives and courses to complete major	7	11	11
	<u>16</u>	<u>16</u>	<u>16</u>

* To be selected in accordance with the General Education-Breadth requirements. (Check with adviser or department office.)

** Teaching option majors may substitute PHYS 121, 122, 123.

*** Teaching option majors may substitute CSC 414.

APPLIED MATHEMATICS OPTION
(Add Courses Below to Mathematics Curriculum)

MATH 304 Vector Analysis	(4)	CSC 332, 333 Numerical Analysis	(6)
MATH 313 Linear Algebra	(4)	MATH 336 Combinatorial Mathemat-	
MATH 318 Advanced Engineering		ics	(3)
Mathematics	(4)	MATH 408 Complex Variables	(4)
MATH 319 Partial Differential Equa-		MATH 413 Advanced Calculus	(3)
tions	(4)		

FINITE MATHEMATICS OPTION
(Add Courses Below to Mathematics Curriculum)

MATH 313 Linear Algebra	(4)	MATH 431-2 Mathematical Optimi-	
MATH 318 Advanced Engineering		zation	(6)
Mathematics	(4)	MATH 437 Game Theory	(3)
MATH 335 Graph Theory	(3)	CSC 219 Linear Programming	(3)
MATH 336 Combinatorial Mathemat-		CSC 319 Computer Simulation	(3)
ics	(3)	CSC 350 Systems Analysis	(3)
		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	
MATH 341 Theory of Numbers	(4)	Mathematics	(3)
MATH 382 Modern Algebra	(4)	MATH 442 College Geometry	(3)
MATH 403 Issues in Secondary		MATH 443 Non-Euclidian Geometry	(3)
School Mathematics Education	(3)	MATH 444 Projective Geometry	(3)
MATH 419 Introduction to History of		CSC 410 Computer Fundamentals for	
Mathematics	(3)	Educators	(3)

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN MATHEMATICS
With Specializations in Mathematics Teaching and in Applied Mathematics
(For University requirements see the *Graduate Study Bulletin*)

	<i>Units</i>
I. Required MATH 506, 508, 515	12
II. *12 units of 500 level courses selected according to specialization	12
III. Select 12 units from any 300, 400, 500 courses having the prefixes: MATH, CSC, STAT. approved by the advising committee	12
IV. ** 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.

* 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.

** 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 Joseph W. Stewart

Major William R. Lipke
Captain Michael B. Newton

Captain Daniel A. Almero
Captain Edward C. Hanigan

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; motivational techniques and the psychology of group dynamics. 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 a full time (12 units) enrolled student at this university, have sufficient time remaining as a university student to permit completion of the advanced course prior to reaching the 28th 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 4 years of college.

EQUIPMENT AND UNIFORMS

All necessary equipment, uniforms and text books 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.

During the third and fourth academic years students are permitted to apply credit for Military Science related academic courses toward ROTC program requirements. These academic courses must be in a field outside the student's major academic discipline, and account for six quarter units during the two-year period.

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 as a commissioned officer, if called.

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 basic ROTC summer 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 1st 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 transportation allowance to and from Basic Camp and pay at the rate of an Army Private. 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 at least six months prior to graduation may elect to be commissioned early and enter the National Guard or Army Reserves as 2nd 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, Robert H. Frost

Lawrence H. Balthaser	Theodore C. Foster	John E. Poling
Ronald F. Brown	Teymoor Gedayloo	David M. Roach
Joseph C. Boone	David W. Hafemeister	Arthur Z. Rosen
Anthony J. Buffa	Kenneth A. Hoffmann	Richard A. Saenz
Arthur S. Cary	Herbert R. Kabat	Thomas G. Schumann
David H. Chipping	James S. Kalathil	Gordon A. Silver
Clyde G. Dease	Leon W. Magur	Keith S. Stowe
Christopher DeLatour	John Mottmann	Willem L. van Wyngaarden
Robert H. Dickerson	Kenneth S. Ozawa	Leonard W. Wall
Walt Elliott	Ralph A. Peters	Walter D. Wilson

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
Life Sciences course (BIO 101, BOT 121, or ZOO 131)	3-4		
Freshman Composition (ENGL 104) or English Composition (ENGL 114)	3-4		
Principles of Speech (SP 200) or Public Speaking (SP 201)		3	
Freshman Composition (ENGL 105) or English Composition (ENGL 115) or Modern or Traditional Logic (PHIL 221 or 222)			3-4
* Physical Education or Psychology elective		1-2	0-1
Analytic Geometry and Calculus (MATH 141, 142, 143)	4	4	4
General Chemistry (CHEM 127, 128)	4	4	
Survey of Organic Chemistry (CHEM 226)			4
General Physics (PHYS 131, 132)		4	4
Introduction to Physics (PHYS 100)	<u>1</u>		
	15-17	16-17	15-17

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

224 Physics

	F	W	S
Sophomore			
Economics (ECON 201 or 211)			3
Analytic Geometry and Calculus (MATH 241)	4		
Differential Equations (MATH 242)		4	
Fortran Programming (CSC 101)	2		
Advanced Engineering MATH (MATH 318)			4
General Physics (PHYS 133, 134)	4	3	
Modern Physics (PHYS 211)		4	
Introduction to Nuclear Physics (PHYS 213)			3
Introductory Nuclear Physics Laboratory (PHYS 243).....			1
Instrumentation in Experimental Physics (PHYS 206, 207).....		2	2
Electrical Measurements Laboratory (PHYS 256, 257)		1	1
* Art, Music, or Theatre elective.....	3		
* Literature elective	3		
* Philosophy elective		3	
* Literature or Philosophy elective.....			3
	<hr/>	<hr/>	<hr/>
	16	17	17
Junior			
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH electives		3	3
* Oral/Written Communication or Logic elective	3		
Partial Differential Equations (MATH 319)		4	
Vector Analysis (MATH 304)	4		
Statistical Physics and Heat (PHYS 301)	3		
Analytic Mechanics (PHYS 302, 303)	3	3	
Solid State Physics (PHYS 406)		3	
Solid State Physics Laboratory (PHYS 456).....			1
Quantum Mechanics (PHYS 405)	3		
Quantum Physics Laboratory (PHYS 341, 342)	1	2	
Physical Optics (PHYS 323).....			4
Undergraduate Seminar (PHYS 363)			2
* General Psychology (PSY 201 or 202)			3
* Anthropology or Sociology elective.....			3
	<hr/>	<hr/>	<hr/>
	17	15	16
Senior			
American and California Government (POLS 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
* Social/Political/Economics Institutions elective.....	3		
Electricity and Magnetism (PHYS 408, 409)	4	3	
Senior Project (PHYS 461, 462)	2	2	
Approved Physics electives	3	3	3
* ART/FOR LANGS/HUM/LIT/MU/PHIL/TH elective			3
Electives		4-6	6
	<hr/>	<hr/>	<hr/>
	15	15-17	15

CURRICULUM IN PHYSICAL SCIENCE

Freshman			
General Chemistry (CHEM 127, 128, 129)	4	4	4
† Physics (PHYS 131, 132 or 121, 122)		4	4

* To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)

† A choice of the PHYS 121-2-3 sequence or CHEM 226 or 328 restricts the Physics and Chemistry electives available to the student later in this program.

	F	W	S
Analytic Geometry and Calculus (MATH 141,2,3 or 131,2,3)	4	4	4
Freshman Composition (ENGL 104) or English Composition (ENGL 114)	3-4		
† Art, Music, or Theatre elective.....	3		
Freshman Composition (ENGL 105) or English Composition (ENGL 115) or Modern or Traditional Logic (PHIL 221 or 222)		3-4	
† Literature elective			3
Elective.....	0-1		
	16	15-16	15
Sophomore			
* Chemistry (CHEM 226 or 316 and 328 or 371)	4		4
* Physics (PHYS 133 or 123 and 211 or 210)	4	4	
** Approved Physics elective		3	
Mathematics, Computer Science, or Statistics electives		4	4
†† Fortran Programming (CSC 101)	2		
Physical Geology (GEOL 201)			3
American and California Government (POLS 201)	3		
Principles of Speech (SP 200) or Public Speaking (SP 201)	3		
Growth of American Democracy (HIST 204)		3	
U.S. in World Affairs (HIST 205)			3
† Physical Education electives	0-1	2-1	
General Psychology (PSY 201 or 202)			3
	16-17	16-15	17
Junior			
Chemistry (CHEM 301 or 305)	3		
Astronomy (ASTR 301 or 302)	3		
† Life Sciences elective.....	3		
** Approved Chemistry elective		4	
** Approved Astronomy and/or Earth Sciences electives.....			4
** Approved Physical Science 300 or 400 level electives		3	3
Social/Political/Economics Institutions elective.....		3	
† Oral/Written Communications or Logic elective.....	3		
† Anthropology or Sociology elective.....	3		
Survey of Economics (ECON 201) or Principles of Economics (ECON 211)			3

- * A choice of the PHYS 121-2-3 sequence or CHEM 226 or 328 restricts the Physics and Chemistry electives available to the student later in this program.
- ** Chosen with approval of adviser.
- † To be selected in accordance with the General Education-Breadth requirements. (See adviser or department office.)
- †† CSC 410 may be substituted for CSC 101.

Electives toward credential requirements:	F	W	S
Learning Process (ED 335)		3	
Reading Methods (ED 434)		2	
Instructional Processes (ED 438)			3
Multicultural Education (ED 301)			3
	15	15	16
Senior			
Senior Project (CHEM, PHYS, or PSC 461)	2		
** Approved Physical Sciences 300- or 400-level elective. (Prospective teachers take Org and Tchg Phys Sci (PSC 424)	3		
** Approved Physics 300- or 400-level elective			3
† Philosophy or Literature elective		3	
† Philosophy elective			3
† ART/FORLANGS/HUM/LIT/MU/PHIL/TH electives			6
Elective	2		
Electives toward credential requirements:			
Diagnosis, Prescription, and Evaluation (ED 436)	2		
Student Teaching (ED 430, 440)	6	12	
Methods of Teaching Reading (ED 435)			3
	15	15	15

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

** Chosen with approval of adviser.

† A choice of the PHYS 121-2-3 sequence or CHEM 226 or 328 restricts the Physics and Chemistry electives available to the student later in this program.



Intercollegiate Athletics

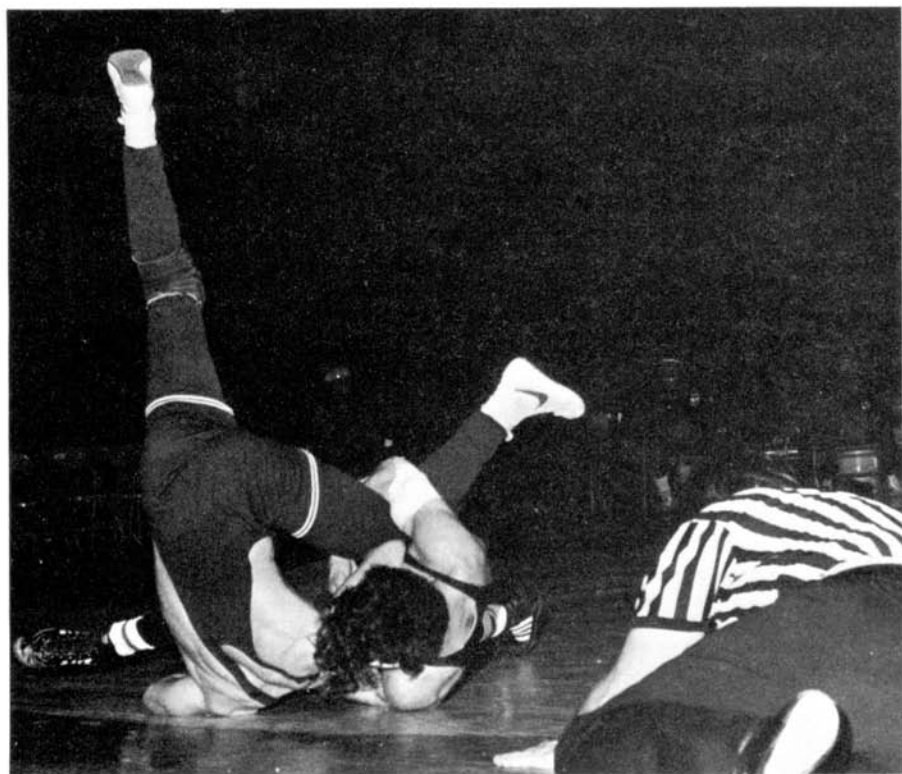
Intercollegiate Athletics Department

Andrew Brennan
 William Brown
 John Crivello
 Wolfgang Gartner
 Kimberly Graham
 David W. Grosz
 Richard R. Harper
 Lance Harter

Berdy V. Harr
 Richard Heaton
 Vaughan Hitchcock
 Mark Johnson
 Bobbie A. Lane
 Marilyn McNeil
 Steve Miller
 Kenneth Peet
 Evelyn I. Pellaton

Andrew J. Proctor
 James D. Sanderson
 Gordon Shaw
 Ernest J. Wheeler, Jr.
 Darla Wilson
 Michael Wilton
 Thomas M. Wood
 Steve Yoneda

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 of the men's teams, with the exception of wrestling, compete at the NCAA Division II level. Wrestling competes at the Division I level. All of the women's programs compete at the AIAW Division II level except for volleyball and cross country, which are Division I.

Cal Poly's victory in the NCAA Division II football championships in the Fall of 1980 was the 16th National Division II Men's Championships for the University, ranking it first in the nation. The women's volleyball, cross country, swimming, gymnastics and basketball teams have all participated in post-season competition.

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	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.....	CSTR
Landscape Architecture.....	LA
SCHOOL OF BUSINESS.....	
Accounting	ACTG
Business Administration	BUS, FPM, 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	SP, TH
SCHOOL OF ENGINEERING AND TECHNOLOGY	
Aeronautical and Mechanical Engineering	AERO, ME
Civil Engineering	CE
Electronic and Electrical Engineering	EE, EL
Engineering Technology	ET, ETAC, ETEL, ETME, ETMP, ETWT
Environmental Engineering	ENVE
Industrial Engineering.....	IE, MFGE
Industrial Technology	IT
Metallurgical and Welding Engineering	MET

SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Child Development and Home Economics	CD, HE
Education	ED, ETHS
Physical Education	PE, PEM, PEW, REC
Psychology	PSY

SCHOOL OF SCIENCE AND MATHEMATICS

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

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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.

<i>PREFIX TITLE</i>	<i>BEGINNING ON PAGE</i>
ACTG ACCOUNTING.....	234
AE AGRICULTURAL ENGINEERING	235
AERO AERONAUTICAL ENGINEERING	241
AG AGRICULTURE	244
AGED AGRICULTURAL EDUCATION	244
AM AGRICULTURAL MANAGEMENT	246
ANT ANTHROPOLOGY	251
ARCE ARCHITECTURAL ENGINEERING	252
ARCH ARCHITECTURE.....	254
ART ART	260
ASCI ANIMAL SCIENCE	266
ASTR ASTRONOMY AND ASTROPHYSICS.....	269
BACT BACTERIOLOGY	269
BIO BIOLOGY	271
BOT BOTANY	274
BUS BUSINESS.....	275
CD CHILD DEVELOPMENT	277
CE CIVIL ENGINEERING	279
CHEM CHEMISTRY	283
CONS CONSERVATION	289
CRP CITY AND REGIONAL PLANNING	289
CRSC CROP SCIENCE	293
CSC COMPUTER SCIENCE	295
CSTR CONSTRUCTION	301
DH DAIRY HUSBANDRY	303
DM DAIRY MANUFACTURING	304
ECON ECONOMICS	305
ED EDUCATION.....	309

EDES	ENVIRONMENTAL DESIGN	315
EE	ELECTRICAL ENGINEERING	316
EL	ELECTRONIC ENGINEERING	320
ENGL	ENGLISH	326
ENGR	ENGINEERING	331
ENT	ENTOMOLOGY	331
ENVE	ENVIRONMENTAL ENGINEERING	332
ET	ENGINEERING TECHNOLOGY	336
ETAC	ENGINEERING TECHNOLOGY—AIR CONDITIONING	336
ETEL	ENGINEERING TECHNOLOGY—ELECTRONIC	338
ETHS	ETHNIC STUDIES	339
ETME	ENGINEERING TECHNOLOGY—MECHANICAL	340
ETMP	ENGINEERING TECHNOLOGY—MANUFACTURING PROCESSES	341
ETWT	ENGINEERING TECHNOLOGY—WELDING	343
FDSC	FOOD SCIENCE	344
FORL	FOREIGN LANGUAGE	347
FPM	FINANCE AND PROPERTY MANAGEMENT	347
FR	FRENCH	348
FRSC	FRUIT SCIENCE	349
GEOG	GEOGRAPHY	350
GEOL	GEOLOGY	351
GER	GERMAN	352
GRC	GRAPHIC COMMUNICATIONS	353
GSB	GRADUATE STUDIES—BUSINESS	356
HE	HOME ECONOMICS	358
HIST	HISTORY	364
HUM	HUMANITIES	369
IE	INDUSTRIAL ENGINEERING	370
IT	INDUSTRIAL TECHNOLOGY	374
JOUR	JOURNALISM	381
LA	LANDSCAPE ARCHITECTURE	382
LIB	LIBRARY	384
MATH	MATHEMATICS	385
ME	MECHANICAL ENGINEERING	391
MET	METALLURGICAL ENGINEERING	395
MFGE	MANUFACTURING ENGINEERING	397
MGT	MANAGEMENT	398
MKTG	MARKETING	401
MSC	MILITARY SCIENCE	402
MU	MUSIC	403
NRM	NATURAL RESOURCES MANAGEMENT	407
OH	ORNAMENTAL HORTICULTURE	412
PE	PHYSICAL EDUCATION	416
PEM	PHYSICAL EDUCATION MEN	416
PEW	PHYSICAL EDUCATION WOMEN	416
PHIL	PHILOSOPHY	423
PHYS	PHYSICS	424
PI	POULTRY INDUSTRY	428
POLS	POLITICAL SCIENCE	430
PSC	PHYSICAL SCIENCE	435
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SOC	SOCIOLOGY	440
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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 undergradu-

ates 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.

ACTG—ACCOUNTING

ACTG 131, 132 Basic Accounting (3) (3)

A study of accounting to show how records are kept, their uses and limitations. For the student who needs a general knowledge of accounting. Not applicable for credit toward major in business administration. Sequence courses. 3 lectures.

ACTG 221, 222 Principles of Accounting (4) (4)

Principles and practices of fundamental accounting theory. Sequence courses. 4 lectures.

ACTG 301 Managerial Accounting (4)

Relationship of accounting to business operations and analysis. Analysis and application of accounting principles and procedures to business organizations. 4 lectures. Prerequisite: ACTG 222 and junior standing.

ACTG 304 Tax Accounting (4)

Federal and state income taxation of individuals. 4 lectures. Prerequisite: ACTG 131 or 221 and junior standing.

ACTG 321, 322 Intermediate Accounting (4) (4)

Conventional financial accounting; theory, problems and contemporary issues. Sequence courses. 4 lectures. Prerequisite: ACTG 301 or consent of instructor and junior standing.

ACTG 323 Advanced Accounting (4)

Accounting theory and practice relating to partnerships, special sales procedures, multinational business operations, and business insolvencies. 4 lectures. Prerequisite: ACTG 322.

ACTG 400 Special Problems for Advanced Undergraduates (1-2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, maximum of 2 units per quarter. 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 403 Accounting For Nonprofit Organizations (4)

Accounting for nonprofit organizations including government and nonprofit businesses. Use of accounting information to control and achieve objectives of the programs involved. 4 lectures. Prerequisite: ACTG 222.

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 lecturers. Prerequisite: ACTG 304.

ACTG 417 Controllership (4)

Function, organization, and responsibilities of the controllership in the business environment. Integration of the accounting function into the corporate organization; role and relationships of the controllership in the corporation. 4 lectures. Prerequisite: ACTG 323 or consent of instructor, senior standing.

ACTG 421 Business Combinations (4)

Authoritative accounting methods and their applications for business combinations including mergers and consolidations. Consideration of related problems and financial reporting requirements. 4 lectures. Prerequisite: ACTG 323 and BUS 207 or consent of instructor.

ACTG 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.

ACTG 431 Professional Accounting (4)

Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his 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 (1-4)

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 3 lectures. Prerequisite: Consent of instructor.

ACTG 500 Individual Study (1-3)

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 and poultry 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. Properties and marketing information on agricultural construction materials. Laboratory skills development in wood, metal, and concrete. 2 lectures, 1 laboratory. Prerequisite: Majors only, MATH 113 or equivalent, college drafting or concurrent enrollment.

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)

A basic course in technical drawing oriented toward working drawings of farm shop projects. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. 1 lecture, 2 laboratories. Prerequisite: Mechanized Agriculture major or consent of instructor.

AE 134 Agricultural Electrification (3)

Fundamentals of circuits, electric wiring and code regulations, load distribution. Wiring of agricultural structures and systems. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: MATH 103 or 113.

AE 141 Agricultural Tractors and Equipment Skills (3)

Operational skills in the selection and matching of agricultural and utility industrial equipment. Supervised operational practice in the field. 2 lectures, 1 laboratory.

AE 142 Agricultural Power and Machinery Management (4)

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. 3 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 annual housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. 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.

AE 236 Principles of Irrigation (4)

Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory. Prerequisite: MATH 141, AE 237.

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)

Use of the transit: traverses, coordinates, triangulation, area and balanced survey calculations. Cross sections, landgrading, and volumes. Topographic and contour by stadia-transit mapping. 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 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.

AE 321 Agricultural Equipment Industry Management (4)

Management and operation of the farm equipment industry. Study of sales, service, parts and product education policies on manufacturer, distributor and dealer level. 3 lectures, 1 laboratory. Prerequisite: AE 142 or AE 143.

AE 322 Principles of Agricultural Machinery (4)

A wide range of applied agricultural machine design problems using stress deflection analysis. Selection of shafts, couplings, clutches, brakes, bearings, and other machine parts. 3 lectures, 1 laboratory. Prerequisite: AE 343.

AE 323 Agricultural Products Handling (3)

The 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 circuits. Applications of electricity in agriculture including motor principles and selection, wiring, and other topics. 3 lectures, 1 laboratory. Prerequisite: AE 134, 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, 302.

AE 331 Irrigation Theory (3)

Plant-water-soil relations concerning evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, soil-water relations, saturated and unsaturated flow, soil aeration, infiltration, and drainage. 3 lectures. Prerequisite: SS 121, MATH 141.

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 208, PHYS 133.

AE 335 Agricultural Power (3)

Principles of spark ignition and compression ignition engines, including liquefied petroleum gas equipment, and related accessories. Service, trouble-shooting and repair procedures of engines and transmissions. 2 lectures, 1 laboratory.

AE 336 Agricultural Power Analysis (3)

Selection and application of internal combustion engines. Theory of combustion, fuels, and lubricants; power and its measurement. Factors affecting horsepower output and engine efficiency. Advanced power transmission. 2 lectures, 1 laboratory. Prerequisite: AE 335, PHYS 123.

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 Dynamic Measurement (3)

Engineering measurements and basic instrumentation. Transducers, signal processors, output devices and controls used in agricultural engineering. 2 lectures, 1 laboratory. Prerequisite: EE 201, 261.

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; evaluations of irrigation methods, water rights and irrigation institutions. Flow of water in pipes and canals, water measurement, wells, and pumps. 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 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 of 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 114.

AE 346 Emission Control (3)

Pollution control devices as found on common agricultural vehicles, light duty trucks and related automotive applications. Local and Federal regulations governing engine emissions. Preparation for state pollution device licensee test. 2 lectures, 1 laboratory. Prerequisite: AE 341 or equivalent.

AE 392 Wells and Pumps (3)

Ground water resources, drilling methods, and development of wells. Pumps and their uses in 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 414, MATH 242, ENGR 251, STAT 321.

AE 414 Irrigation and Drainage Engineering (4)

Design of farm and project irrigation and drainage systems. Influence of soils, crops, climate, and costs on the frequency, rate, and duration of economical water delivery. Pipeline and ditch distribution systems; reservoirs, pumps, and drains; economics of systems and components. 3 lectures, 1 laboratory. Prerequisite: AE 236, 312, 331.

AE 421 Equipment Engineering (4)

Design and construction of specialized agricultural equipment. 2 lectures, 2 laboratories. Prerequisite: CE 209, ME 212, ETWT 144.

AE 422 Equipment Engineering (3)

Analysis and design of equipment with emphasis on man-machine-plant-automata relationships and concepts. 2 lectures, 1 laboratory. Prerequisite: AE 421.

AE 425 Electrical and Electronic Controls for Agricultural Equipment (3)

The principles and selection of electrical and electronic controls for use in the agricultural industry. Applications in agricultural machinery, agricultural structures, agricultural processing and irrigation. 2 lectures, 1 laboratory. Prerequisite: AE 324.

AE 427 Agricultural Process Engineering (3)

Thermodynamics and mass transfer 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 and ENVE 313.

AE 432 Agricultural Buildings (4)

Selection of buildings, storage units, and related equipment for production agriculture. Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, 231, 343.

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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 209.

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, 331, or 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. 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)

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.

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 581 Graduate Seminar in Agricultural Engineering (3)

Group study of current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology are emphasized in problem solution. 3 seminars.

AERO—AERONAUTICAL ENGINEERING

AERO 100 Aerospace Vehicles Fundamentals (3)

Introduction to aerospace vehicles, aircraft, missiles, satellites, spacecraft, vehicles, and Space Shuttle; their applications, in addition to research, science, transportation, are in defense, agriculture, forestry, pollution control, weather, medicine, biology, computers, geodesy, seismology, energy production, astronomy, surveillance of earth resources, etc. 3 lectures.

AERO 102 Introduction to General Aviation (3)

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 (2) (2) (2)

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. 2 laboratories.

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 201 Introduction to Applied Aerodynamics (3)

Introduction to Applied Aerodynamics. Primary emphasis on aircraft, missile and satellite performance, and basic aerodynamics. Subjects covered: atmosphere, wing theory, drag, airfoil theory, static flight performance, and dynamic flight performance. 3 lectures. Prerequisite: MATH 142.

AERO 203 Aero Laboratory (2)

Aero instrumentation for use with wind tunnels and aeroballistic ranges such as strain gauges, force balance system, pitot tubes, monometers, hot wire anemometer, dynamic supports, etc. Reduction facilities, techniques, and electronic instrumentation will be covered. 1 lecture, 1 laboratory.

AERO 205 Energy Science (3)

Scientific, engineering and technological fundamentals for the utilization of alternate energy resources for propulsion, power, heat, etc., and review of research and development in this area. 3 lectures. Prerequisite: CHEM 124 and PHYS 133.

AERO 240 Additional Engineering Laboratory (1-2)

Total credit limited to four units, with not more than two units in any one quarter. 1 or 2 laboratories.

AERO 301, 302, 303 Aerothermodynamics (4) (4) (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. 4 lectures. fall and winter; 3 lectures, spring. Prerequisite: ME 211, MATH 242.

AERO 304 Aerothermodynamics Laboratory (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. 2 laboratories. Prerequisite: AERO 301.

AERO 306 Aerodynamics (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.

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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 208, 209.

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 406 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.

AERO 407 Aerospace Science (3)

History of aviation, rocketry, and space flights; fundamentals, propulsion of flight vehicles, trajectories and orbital mechanics, aerodynamics, re-entry, pyrotechnics, nucleonics, electrical power for guidance, telecommunication; aerospace environment, flight vehicles, spacecraft, and sounding rockets. 3 lectures. Prerequisite: Junior standing.

AERO 408 Advanced Flight Vehicle Structural Analysis (4)

Deformation of determinate and indeterminate structures. Virtual work. Dummy load method, Maxwell-Betti reciprocal theorem, Castigliano's theorem. Introduction to matrix methods. 3 lectures, 1 laboratory. Prerequisite: AERO 324, MATH 318.

AERO 409 Flight Testing (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. 3 lectures. 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.

AERO 415 Aerodynamics of Stability and Control (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. Dynamic longitudinal stability. 3 lectures. Prerequisite: AERO 306.

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 444, 445 Flight Vehicle Design Laboratory (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) (2)

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 120 hours total time. Prerequisite: Senior standing.

AERO 463 Undergraduate Seminar (2)

Studies and technical developments in the field of Aeronautical Engineering. 2 meetings. Prerequisite: Senior standing.

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. One to three 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: 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 lectures. Prerequisite: ME 427 or senior level structural design course.

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 lectures. Prerequisite: AERO 306 or equivalent.

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 lectures. Prerequisite: AERO 401 or equivalent.

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AERO 507 Fuels and Propellants (3)

Properties of liquid, solid, and gaseous fuels and propellants. Combustion and reaction thermodynamics; theoretical specific impulse computation. Flame theory; ionization and high temperature gas dynamics. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

AERO 551 Aeronautical Systems Analysis (3)

Various system modeling methods applied to aeronautical systems. System stability studies and system optimization methods. 3 lectures. Prerequisite: 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 050 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. Students do not receive degree credit for enterprise projects. Registration is through department offices and subtopics will list the department supervising the project. Some projects may be offered with Credit/No Credit grading. Repeatable.

AG 301 Agriculture and American Life (3)

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)

The selected student 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.

AG 500 Individual Study (1-3)

Advanced independent study planned and completed under the direction of a member of the school faculty. Enrollment by petition. 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, 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 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 lectures.

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.

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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 lectures.

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 lecture, 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 to be submitted. Total credit limited to nine units with not more than three 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. The role of agricultural resources in economic growth. 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, records, information, location, production, business with banks, labor and government. 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.

AM 230 General Agricultural Management (3)

General introduction and overview of Agricultural Management; principles and procedures in planning, organizing and managing farm related agribusinesses. Taken by non-Agricultural Management majors. 3 lectures.

AM 250 Computer Application to Agriculture (3)

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 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. 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 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 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. 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 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 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 211.

AM 322 Principles of Farm Management (4)

Study of 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 222.

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 222.

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 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 2-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.

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 405, 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 207, 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 load 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. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 213, STAT 212.

250 AM

AM 427 Agricultural Estate Planning (4)

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, 1 activity period. 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 222.

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 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.

AM 463 Undergraduate Seminar (2)

Individual or group presentation for discussion of subjects and problems within the Agricultural Management field. 2 lectures.

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. One to three 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 lectures. Prerequisite: AM 307 or 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 lectures. Prerequisites: AM 301, 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 lectures. Prerequisite: AM 307.

AM 581 Graduate Seminar in Agricultural Management (3)

Group study of selected developments, trends and problems in the field. 3 lecture-discussions.

ANT—ANTHROPOLOGY**ANT 201 Cultural Anthropology (3)**

The 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)

The 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)

The 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.

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)

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, 222, 223 Structures (3) (3) (3)

Forces on building structures. Statics and stability of structural systems. Physical properties. Derivation and development of stress-strain relationships and deflection theory. Analysis and synthesis of structural systems in the design process. 3 lectures. Prerequisite: PHYS 131, MATH 142.

ARCE 224 Structures (3-9)

Forces on building structures. Statics and stability of structural systems. Physical properties. Derivation and development of stress-strain relationships and deflection theory. Analysis and synthesis of structural systems in the design process. 3-9 lectures. Prerequisite: PHYS 131, MATH 142.

ARCE 225 Building Structural Systems and Dynamics (3)

Building structural systems, static and dynamic loads, rigid body dynamics. Vibrations of structural members. Degrees of freedom and vibration modes. 3 lectures. Prerequisite: MATH 143. Corequisite: 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 and photoelastic methods. 1 laboratory. Prerequisite: ARCE 223 or concurrent.

ARCE 302 Structural Analysis (3)

Analysis of statically determinate and indeterminate structures. Introduction to the principles of work-energy. 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 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. Prerequisite: LA 231.

ARCE 321, 322, 323 Structures (3) (3) (3)

Analysis and design of steel, timber, masonry and concrete structures for gravity and lateral loads. Limitations and potentials of the materials in relation to the design and construction process. For architecture and construction students. May be taken out of sequence. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

ARCE 361, 362, 363 Structures Laboratory (3) (3) (3)

Introduction to use of digital computers in structural analysis. Studies in structure-form relationships, geometry and stability of structural systems. Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCH 232, ARCE 223, EDES 203; ARCE 303 for ARCE 363 only. Concurrent enrollment in ARCE 302 required for ARCE 361.

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 225, 306, MATH 242.

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 444.

ARCE 415 Concrete Testing Laboratory (1)

Study of 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 utilizing conventional and finite difference methods. Pile foundations and sheet pile retaining structures. Emphasis placed upon computer solutions. 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. Prerequisite: ARCE 363.

ARCE 444 Structural Design (4)

Design of reinforced concrete structures. Theory and application to building structural systems. 4 activities. Prerequisite: ARCE 301, 302 and 363.

ARCE 445 Structural Design (4)

Design and analysis of prestress concrete and masonry structures. 4 activities. Prerequisite: ARCE 301, 302, and 363.

ARCE 446 Structural Design (4)

Multistory buildings, bridges, shells, arches, and cable structures. 4 activities. Prerequisite: ARCE 301, 306 and 363.

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ARCE 451, 452, 453 Design Projects (3) (3) (3)

Selected projects utilizing timber and reinforced concrete. Final design project of significant scope including materials selection and may include physical modeling. 3 laboratories. Prerequisite: ARCE 304 for 451, ARCE 444 for 452, ARCE 445 and 452 for 453.

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 Seismic Laboratory (1)

Laboratory studies utilizing physical models for the analysis of structures subjected to simulated ground motions. 1 laboratory. Prerequisite: ARCE 306. Concurrent: ARCE 483.

ARCE 482 Structural Models Laboratory (1)

Testing and analysis of structural models in timber, steel, concrete and microconcrete, and plastics. 1 laboratory. Prerequisite: ARCE 301 and 322 or 444.

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 306.

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 106 Materials of Construction (3)

Use and application of construction processes and materials. 3 lectures.

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 203 Architectural Design Fundamentals (3)

Analytical techniques, problem solving methodologies, and design fundamentals related specifically to architectural projects. 3 laboratories. Prerequisite: EDES 202, ARCH 213.

ARCH 204 Architectural Theory (3)

Identification of the elements which constitute an architectural design theory in its completed state. Testing of the composition of topical architectural theories. 3 lectures. Prerequisite: EDES 101.

ARCH 213, 214, 215 Advanced Delineation (2) (2) (2)

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: EDES 112.

ARCH 221 Introduction to Environmental Design Science (3)

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. 1 lecture, 2 recitations. Prerequisite: PHYS 131, 132.

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 241, 242 Watercolor (1) (1)

Outdoor sketching with watercolor. 1 laboratory. Prerequisite: Permission of instructor.

ARCH 245 Urban Design in Architecture (3)

The design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 104.

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. 1-3 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 203.

ARCH 307 Alternative Energy in Architecture (3)

Alternative energy systems with emphasis on passive solar systems; the use of on-site thermal sources and sinks to provide space heating and cooling by architectural means. Systems comparisons, analysis and calculation techniques. 3 lectures. Prerequisite: ARCH 203. Recommended: ENVE 221.

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ARCH 308 Building Support Systems (3)

Definitions and explanation of codes, licenses, permits and space requirements relating to plumbing and electrical systems; principles, performance criteria, design layout, sizing product selection, cost analysis of sanitary drainage, storm drainage, domestic and hot water, fire protection, lighting and electrical systems of buildings. Systems comparisons and cost benefit studies. 3 lectures. Prerequisite: ARCH 203, 232, EDES 250.

ARCH 309 Building Support Systems (3)

Definitions and explanation of codes, licenses, permits and space requirements of vertical transportation system, space heating, ventilating, cooling systems; principles, performance criteria, design layout, sizing, product selection, cost analysis of vertical transportation system, heating, ventilating and cooling systems of buildings. Systems comparisons and cost benefit studies. 3 lectures. Prerequisite: ARCH 203, 232, EDES 250.

ARCH 310 Introduction to Architectural Systematic Design Methods (3)

Architectural problem solving by means of systematic design methods. Use of decision making techniques as environmental design aids. 3 lectures. Prerequisite: Second-year standing in School of Architecture and Environmental Design or consent of instructor.

ARCH 312 Home and Community Design (3)

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 (3) (3) (3)

Periods of architecture; philosophies and conditions which influenced them. 3 lectures. May be taken out of sequence. Prerequisite: ENGL 104.

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 using preliminary designs of students in coordinated architectural design classes ARCH 351, 352, 353. 2 laboratories. Prerequisite: ARCH 203, 232. Concurrent: ARCH 351, 352, 353.

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 (4)

Development of logical analysis and creative abilities through application of skills to the solution of architectural problems with emphasis in theory of architecture. 4 laboratories. Prerequisite: EDES 110, 203, ARCE 223, ARCH 232.

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: EDES 110, 203, ARCE 223, ARCH 232.

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: EDES 110, 203, ARCE 223, ARCH 232.

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 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. 5 laboratories. Prerequisite: ARCH 308, 309, 343, 351, 352, 353, ARCE 321, 322, 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. 5 laboratories. Prerequisite: ARCH 308, 309, 343, 351, 352, 353, ARCE 321, 322, 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 308, 309, 343, 351, 352, 353, ARCE 321, 322, 323.

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ARCH 458 Computer Graphics Applications in Architecture (2)

Computer graphics techniques as they relate to applications in working drawings and design. 2 activities. Prerequisite: MATH 143, EDES 250.

ARCH 461, 462 Senior Project (2) (2) (CR/NC)

Selection and completion of a comprehensive type project under faculty supervision. Problems will involve students' technical and creative skills. Construction encouraged. To be completed in two consecutive quarters. 120 hours minimum total time. Credit/No Credit grading only. Prerequisite: ARCH 353.

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 meetings. 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. No subtopic may be repeated for credit. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Third-year standing in Architecture.

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. 5 laboratories. Prerequisite: ARCH 441, 442, 443 and 15 units of ARCH 451.

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 502 Building Construction and Performance (3)

Comparative analysis of the performance of selected systems of building construction with particular emphasis on nonstructural functions. 3 seminars. Prerequisite: Consent of instructor.

ARCH 510, 511 Systematic 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. 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 lectures. 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 lectures. Prerequisite: Consent of instructor.

ARCH 533 Architectural Programming (3)

Fundamentals of professional process as prescribed by law and ethics. Product design as determined by architectural implications of user needs and building systems. A search for parameters. 3 seminars. Prerequisite: Consent of instructor.

ARCH 540 Environmental and Regulatory Agencies (3)

Regulatory agencies and environmental laws. Parameters limiting to the design professions. Comparisons of project proposals with environmental acceptance. 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. ARCH 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 meetings. Prerequisite: Graduate standing with 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 meetings. 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 activity periods.

ART 104 Introduction to Art Materials (3)

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activity periods.

ART 111 Introduction to Art (4)

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 121 Introduction to Photography (2)

A nonlaboratory course on the basics of B/W photography for the individual who wishes to improve photographic technique. Cameras, camera handling, films, composition, lighting, and camera accessories. 2 lectures.

ART 124 History of Photographic Processes (2)

A survey of the development of photographic apparatus and processes. Emphasis on the effect numerous processes had on image-making in their particular period, as well as related effect on other media. 2 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 141 Introduction to Crafts (3)

Basic experiences in three-dimensional processes in contemporary crafts with clay, metal, wood. Lecture topics review philosophic traditions and anticipate tool and material activities in problem solving. Creative statement and development of personal design concepts expected. 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. 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. 3 activities.

ART 211 Art History—Prehistoric through Roman Civilization (4)

A chronological and analytical study of outstanding art of ancient cultures in Europe and the Eastern Mediterranean. Emphasis upon painting, sculpture, and related visual arts as a reflection of historical background factors. 4 lectures.

ART 212 Art History—European Medieval Art (4)

A study of significant visual expressions in Europe from the Roman, Early Christian through the Gothic Eras. Emphasis upon religion and social factors that influenced Medieval art. Byzantine and Early Islamic arts are also surveyed. 4 lectures.

ART 213 Art History—Renaissance through Baroque (4)

An analytical study of painting, sculpture and the related visual arts that coincide with chronological developments in history, philosophy, and religion from the European 15th through the 17th centuries. The unique contributions of major artists of these eras are also studied. 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 224 35mm Advanced B/W Photography (3)

Advanced black and white photography. Small format cameras, sensitometry, studio, strobe, available light, developing, printing, black and white transparencies, retouching, copying and visual communication of facts and ideas. 2 lectures, 1 laboratory. Prerequisite: ART 221 or consent of instructor.

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 231 3-Dimensional Design (3)

Study of 3-dimensional forms and relationships applied in various materials and processes. 1 lecture, 2 laboratories. Prerequisite: ART 131, 132, 133, or consent of instructor.

ART 232 Functions of Design (3)

Survey of design in areas pertinent to the environment; lecture-discussion related to current design trends. Involvement of the individual in the environment. 3 lectures. Prerequisite: ART 231 or consent of instructor.

ART 233 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 232 or consent of instructor.

ART 236 Calligraphy and Letterforms (3)

Development of the fundamental dextral skills necessary for accurate rendering of historic and contemporary letterforms. Development of visual skills necessary to sensitively space letterforms together to form words, sentences, and paragraphs. 3 activities.

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 are studied while students develop 3-dimensional projects. 1 lecture, 2 activities.

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. 1 lecture, 2 laboratories.

ART 250 Wood Design (3)

Development of design concepts for wood using sketches, drawings, and models. Familiarization with basic woodworking tools and processes. Design and execution of projects using stacked laminates. Awareness of design as it applies to production of single and multiple objects. 1 lecture, 2 laboratories.

ART 255 Metalsmithing (3)

Nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on design and craftsmanship, awareness of design as it applies to production of single and multiple objects. 1 lecture, 2 laboratories.

ART 301, 302 Advanced Drawing (3) (3)

Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: ART 131 and 201.

ART 303 Life Drawing (3)

Advanced problems in life drawing. Development of advanced methods and techniques in the study of form and structure. 3 activities. Prerequisite: ART 301.

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 307 Printmaking (3)

Contemporary and traditional printmaking techniques. Application of two-dimensional concepts to original prints. 3 activities. Prerequisites: ART 101, 201 or consent of instructor.

ART 308 Sculpture (3)

Continuing exploration of three-dimensional form through sculptural techniques. Advanced problems in modeling, casting, carving, and techniques of assembly. 3 activities. Prerequisite: ART 208 or consent of instructor.

ART 311 History of Modern Art (3)

Tracing the major art movements, innovations and ideologies of artists from the mid-19th century to the outbreak of World War I. Emphasis on Western Europe. 3 lectures. Prerequisite: ART 111 or 200-level art history course or consent of instructor.

ART 312 History of Contemporary Art (3)

Study of art from World War I to the present with an emphasis on the last 40 years. Avantgarde 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 313 History of American Art (3)

Survey of art, with an emphasis on painting and sculpture, from Colonial America to the Depression. Parallels to American socio-economic history, literature, and philosophy are discussed. 3 lectures. Prerequisite: ART 111 or 200-level art history course or consent of instructor.

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 Photograph 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 228.

ART 325 4x5 Camera Techniques, B/W (3)

Basic techniques using 4x5 view cameras. Architecture, landscapes, portraiture, and other outdoor subjects are used to help the student master the use of large format cameras. Other topics include exposure techniques, perspective, and sharpness correction, lighting and composition. A sensitometric approach to B/W film development and print quality will be stressed. 2 lectures, 1 laboratory. Prerequisite: ART 221 and 224.

ART 326 4x5 Camera/Commercial (3)

Professional techniques with large format cameras. Outdoor and studio photography are presented using black and white film and color transparencies. Topics include studio lighting for glass and metal, copying, interiors, and product photography. 2 lectures, 1 laboratory. Prerequisite: ART 226 and 323.

ART 331, 332, 333 Graphic Design (3) (3) (3)

Investigation and experimentation in art structure, color and design. Relation of aesthetic concepts to practical two and three dimensional problems in advertising, packaging, display and exhibits. Lettering skill will be emphasized. 3 activities. Prerequisite: ART 233 or consent of instructor.

ART 336 Exhibition Design/Museum Studies (3)

Theory and applied principles of exhibition design for art objects in the museum or gallery setting. Covers related topics of conservation of art objects, registration, shipping, lighting, security. Class responsible for planning and installing actual gallery exhibitions. 2 lectures, 1 laboratory. Prerequisite: ART 131 or 141 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. 2 lectures, 2 activities. Prerequisite: ART 141, 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. 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. 1 lecture, 2 laboratories. Prerequisite: ART 242 and 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 production of single and multiple objects. 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. 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. 2 lecturers, 1 laboratory. Prerequisite: CHEM 106 and ART 346 or consent of instructor.

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ART 350 Wood Design (3)

Development of design skills. Familiarization with tool processes, joinery, and construction methods. Individual design statement expected. Awareness of design as it applies to production of single and multiple objects. 3 activities. Prerequisite: ART 250 or consent of instructor.

ART 351 Wood Design (3)

Continued development of design skills. The formed laminate process of furniture construction will be developed. Individual design statement expected. 3 activities. Prerequisite: ART 350 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. 3 activities. Prerequisite: ART 255 or consent of instructor.

ART 356 Metalsmithing (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 production of single and multiple objects. 3 activities. Prerequisite: ART 255 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, solarization, 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/Creative Color Photography (4)

Multi-media presentation, synchronizing creative 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 221 and 224.

ART 427 Illustration Photography II, Color (3)

Applied principles of design and color to produce a photograph that sells an idea, product, or service. 35mm and 2¼ cameras used. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 322, 323, 426.

ART 431, 432, 433 Advanced Graphic Design (3) (3) (3)

Laboratory problems in practical advertising design with emphasis on mass media, page layout, and related areas. Contemporary trends in graphic design. 3 activities. Prerequisite: ART 333 or consent of instructor.

ART 445 Advanced Ceramics (3)

Study of 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 are emphasized. Awareness of design as it applies to projection of single and multiple objects. 3 activities. Prerequisite: ART 345 and 346 or consent of instructor.

ART 446 Advanced Ceramics (3)

Study of surface development on pottery or sculpture. 3 activities. Prerequisite: ART 346 or consent of instructor.

ART 447 Advanced Ceramics (3)

Forming methods as used in industry. 3 activities. Prerequisite: ART 445 or consent of instructor.

ART 450 Wood Design (3)

Advanced design concepts applied to joinery and the construction process of formed plywood as used in furniture. Individual design statement expected. 3 activities. Prerequisite: ART 351 or consent of instructor.

ART 451 Wood Design (3)

Advanced design concepts applied to advanced joinery using such methods as handcut and running dovetails. Individual design statement expected. 3 activities. Prerequisite: ART 351 or consent of instructor.

ART 455 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. 3 activities. Prerequisite: ART 355 and 356 or consent of instructor.

ART 456 Metalsmithing (3)

Advanced design concepts applied to metalsmithing techniques. Awareness of design as it applies to the production of single and multiple objects. 3 activities. Prerequisite: ART 455 or consent of instructor.

ART 457 Metalsmithing (3)

Advanced study in the field of metalsmithing with emphasis on design and craftsmanship. Awareness of design as it applies to the production of single and multiple objects. 3 activities. Prerequisite: ART 456 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, resume 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. Prerequisite: Senior standing.

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. One to three 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, esthetics, function, materials, processes and costs. 5 activities. Prerequisite: Senior standing and consent of instructor.

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ART 483 Crafts Marketing (2)

Production costs, exhibitions and sales practices, appropriate and effective exposure and marketing of craft productions. Final evaluation reports include financial accounting and suggestions for improving design, production and marketing. 2 activities. Prerequisite: ART 482 or consent of instructor.

ASCI—ANIMAL SCIENCE

ASCI 101 Feeds and Feeding (4)

Simple use of food nutrients. Identification and classification of feeds for each class of livestock. The 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, 1 laboratory.

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 college. Marketing of beef cattle. 3 lectures. Prerequisite: ASCI 101.

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 practice 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 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. 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 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 230, a botany or crops science course.

ASCI 230 General Animal Science (4)

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 232 Elements of Horse Management (4)

Status of the horse industry. Breeds of horses and their uses. Anatomy and parts of the horse, horse judging. Study of good and faulty conformation. Unsoundnesses, ailments and their treatment. Determination of age. Early history of the horse. 3 lectures, 1 laboratory. Prerequisite: ASCI 101.

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 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 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 101, CHEM 226.

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.

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 101, 111.

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 101, 112.

ASCI 313 Sheep Management (3)

Detailed study of managerial practices for both commercial and purebred sheep enterprises. Performance testing and carcass evaluation techniques. The preparation and merchandising of the wool clip. Introduction to wool processing. 3 lectures. Prerequisite: ASCI 101, 113.

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. 3 lectures, 1 laboratory. Prerequisite: ASCI 101.

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 232.

ASCI 334 Feed Mill Operation (4)

Study of general operation of a feed mill including a survey of the industry, buying, storing, grinding, weighing, mixing, packaging, handling, and delivery of formula feeds. Also a study of flow of materials, preventive maintenance and safety in a mill. 3 lectures, 1 laboratory. Prerequisite: ASCI 101.

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)

Intensive study of 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)

The 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 lectures.

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. One to three 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 lectures.

ASTR—ASTRONOMY AND ASTROPHYSICS**ASTR 101 Introduction to the Solar System (3)**

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)

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 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 123. ASTR 301 is not a prerequisite. Not open to students who have completed ASTR 102.

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.

ASTR 351 Observational Astronomy (1)

Practical observing experience using stellar coordinate systems to locate and photograph celestial objects with the telescope. Topics of observational interest such as the lunar surface, planetary orbits, stellar magnitudes and stellar classification. 1 laboratory. Prerequisite or concurrent. ASTR 301 or 302 or consent of instructor.

BACT—BACTERIOLOGY**BACT 221 General Bacteriology (4)**

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 college chemistry and BOT 121 or ZOO 131.

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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 prokaryotes; a survey of the microbial groups. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

BACT 322 Dairy Bacteriology (4)

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 224.

BACT 333 Industrial Microbiology (4)

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 224, CHEM 226.

BACT 342 Sanitary Microbiology (4)

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations 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 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 224. Recommended: CHEM 226.

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 226. 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 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. 2 lectures, 1 demonstration and discussion hour. Not open to degree students for degree credit.

BIO 101 General Biology (3)

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)

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)

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 127 Natural History: Animal Adaptations (3)

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)

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. Prerequisite: None. Recommended: BIO 127.

BIO 129 Natural History: Plant Communities (3)

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 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 301 Human Ecology (3)

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)

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)

Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics.

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BIO 304 Molecular Genetics (2)

Introduction to the structures, functions, and regulatory mechanisms of nucleic acids in biological systems. 2 lectures. Prerequisite: One quarter of college biology. Recommended: BIO 303 and one course in biochemistry.

BIO 311 Radiation Biology (3)

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 128 and one of the following: BIO 101, BOT 121, ZOO 131.

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)

Study of the 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)

Study of 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 431 Physiology I: General (4)

The functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: CHEM 226; 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 321.

BIO 461, 462 Senior Project (2) (2)

Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in both oral and written reports. Minimum 120 hours total time.

BIO 463 Undergraduate Seminar (2)

Study and discussion of recent developments in the field of biology. 2 meetings. 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 lectures. 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 lectures, 1 laboratory. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.

BIO 527 Cell Physiology (4)

Functional organization of cells, their environment, and energy metabolism. Laboratory exercises in dynamic aspects of cell physiology. 2 lectures, 2 laboratories. Prerequisite: Graduate standing and CHEM 328, MATH 118, BIO 431.

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BIO 530 Toxicology (3)

Toxicology of natural products, drugs, and chemicals; environmental, economic, and forensic aspects. 3 lectures. Prerequisite: Graduate status, CHEM 328 and BIO 431 or their equivalents.

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 lectures, 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 lectures. 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 activity. 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)

Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

BOT 122 General Botany (4)

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)

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. 2 lectures, 1 laboratory. Prerequisite: BOT 121 or consent of instructor.

BOT 322 Introductory Plant Physiology (4)

A 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 226.

BOT 323 Plant Pathology (4)

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 123.

BOT 324 Ornamental and Forest Pathology (4)

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)

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)

Field identification of native and introduced plants in nature; factors affecting California plant distribution and relationships. Emphasis on local species. Several extended field trips. 2 lectures, 2 laboratories. Prerequisite: BOT 123 or equivalent.

BOT 334 Morphology of Vascular Plants (4)

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)

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 Algae (4)

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)

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 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.

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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)

An 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)

The American legal system, contracts, agency, business organizations, and real property. 4 lectures. Prerequisite: Sophomore standing.

BUS 308 Advanced Business Law (4)

The 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 (1-2)

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 or consent of instructor.

BUS 404 Governmental and Social Influences on Business (4)

An analysis of the business enterprise in changing legal, social, political and ethical environment. The influence of administrative law, and the regulatory effects of anti-trust, environmental and securities law on the corporation. 4 lectures. Prerequisite: Senior standing.

BUS 419 Business Research (3)

Information gathering principles and techniques used in study and analysis of business activities. 3 seminars. Prerequisite: All 300-level Business core courses.

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 (1-3)

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.

CD—CHILD DEVELOPMENT

CD 101 Orientation (2) (CR/NC)

Introduction to the child development major from campus and career perspectives. Offered only on a Credit/No Credit basis. 2 lectures.

CD 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.

CD 108 Child, Family, and Community (3)

Influence of parents, teachers, cultural forces, community programs and legislation on the development of individuals across the lifespan. A topical approach to current issues in human development. 3 lectures.

CD 125 Infant and Toddler Development (3)

Development and behavior from conception through the second year. Characteristic social, physical and sensorimotor behavior patterns of infants and toddlers in relation to the environment. 3 lectures. Prerequisite: PSY 201 or 202.

CD 130 Laboratory I: Beginning Study of Children and Families (3)

Introduction to children and families in the preschool and home environment. Participant observation and interaction with children, teachers, peers and parents. 1 lecture, 2 laboratories.

CD 200 Special Problems for Undergraduates (1-2)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CD 203 Family Development (3)

Survey of family living at each stage of the life cycle. Emphasis on developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

CD 225 Preschool and Middle Childhood Development (3)

Development and behavior from the third through the ninth year. Intellectual, physical, emotional, social, and moral development of the young child. 3 lectures. Prerequisite: CD 125 or consent of instructor.

CD 229 Preschool Program Planning (3)

Curriculum development and analysis of preschool programs for young children with emphasis on activities, environment and communication. 3 lectures. Prerequisite: CD 130, 225. Concurrent with CD 230.

CD 230 Laboratory II: Children and Families in the Preschool (4)

Faculty supervised on-campus teaching experience with children and families in a preschool laboratory setting. 2 lectures, 2 laboratories. Prerequisite: CD 130, 225. Concurrent with CD 229.

CD 301, 302 Ethnic Minorities: Children and Families (3) (3)

Socio-cultural dimensions involved in the learning and socialization processes of various ethnic minority groups. Emphasis on history, experiences and cultural backgrounds. 3 lectures. Sequence courses, CD 301 is prerequisite to CD 302.

CD 303 Family Interaction (3)

Dynamic aspects of family interaction. Examination of behavior, attitudes, values, and reciprocity within a variety of family settings. 3 lectures. Prerequisite: CD 103 and 203.

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CD 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: Upper division or graduate standing, or consent of instructor.

CD 325 Adolescence (3)

Development and behavior during the years between prepubescence and young adulthood. 3 lectures. Prerequisite: CD 225 or consent of instructor.

CD 329 Introduction to Research in Child and Family Studies (3)

A survey of current approaches to research in child and family studies. Principles and methods of planning proposals for studying children and families. 3 lectures. Prerequisite: Upper division standing.

CD 330 Child Development Field Experience (3-6)

Supervised field experience in a preschool, child care center or community facility. Consultation with faculty supervisor. Prerequisite: CD 230, 304, PE 280 and consent of instructor. Must be taken for a total of 6 units. Either two consecutive quarters (3 units each) or one quarter (6 units).

CD 400 Special Problems for Advanced Undergraduates (1-2)

Supervised investigation, including a written report, of a topic chosen with the prior approval of instructor. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

CD 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 lectures. Prerequisite: CD 330 or consent of instructor.

CD 404 Administration of Child Development Centers (3)

Organization and administration of preschool and child care centers. Staffing, finance, equipment, records, regulations and community relations. 3 lectures. Prerequisite: CD 330, 401.

CD 413 Parent-Child Relationships (3)

Reciprocal interaction between parents and children. Styles of parenting and their effects on the socialization process. 3 lectures. Prerequisite: Junior standing.

CD 421 Developmental Processes (3) (Also listed as PSY 421)

A 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 lectures. Prerequisite: CD 125, 225, 230 and 325, or graduate standing and consent of instructor.

CD 425 Adulthood and Aging (3)

A developmental analysis of the middle and later stages of the life cycle. 3 lectures. Prerequisite: CD 325 or consent of instructor.

CD 430 Child Development Experimental Lab (6)

Supervised experience working with children. Application of knowledge of development and research methodology to selected problems. Prerequisite: CD 329, 330, 401 and 421.

CD 450 Introduction to Family Counseling (3)

Basic elements of marriage and family counseling. Emphasis on concepts, goals, and techniques of various counseling approaches. 3 lectures. Prerequisite: Upper division or graduate standing or consent of instructor.

CD 451 Family Crises (3)

Analysis of causes and effects of crises on the family. Methods for prediction, control, and solution of family crises. 3 lectures. Prerequisite: Upper division or graduate standing or consent of instructor.

CD 453, 454, 455 Supervised Field Work (4) (4) (4)

Supervised field work in public or private agencies. Maximum of 4 units per quarter. Minimum of 8 units required for Family Studies concentration students. Prerequisite: CD 230, 304, junior standing and consent of instructor.

CD 461, 462 Senior Project (2) (2)

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 120 hours total time. Prerequisite: CD 330 or CD 453 and consent of instructor.

CD 463 Undergraduate Seminar (2)

Study and discussion of current developments in the field of child development. 2 lectures. Prerequisite: Senior standing.

CD 464 Current Issues in Family Life Education (2)

Evaluation of the role of family life specialists in relation to the teaching profession, public service agencies, and the community. 2 lectures. Prerequisite: CD 203 or consent of instructor.

CD 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.

CD 481 Family Theory (2)

Analysis of the major theoretical approaches to family behavior. 2 lectures. Prerequisite: Senior standing.

CE—CIVIL ENGINEERING**CE 121 Civil Engineering Fundamentals (2)**

Engineering approach to problem solving. Analysis of land, air, and water transportation systems. Basic nomenclature and design criteria used in the field. Applications to specific problems. Discussions with practicing engineers on subjects of current interest. 1 lecture, 1 laboratory.

CE 122 Civil Engineering Fundamentals (2)

Continuation of CE 121. Application of basic design criteria to specific design problems. 1 lecture, 1 laboratory.

CE 123 Civil Engineering Fundamentals (2)

Introduction to problem solving and analysis of data necessary in the profession. Methods and techniques available to the civil engineer for use in study and design of systems. 1 lecture, 1 laboratory.

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 207. CE 202: 3 lectures; CE 203: 1 lecture, 1 laboratory. Prerequisite: ME 205.

ETME 205

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CE 207 *Strength of Materials* (5)

Stresses, strains, and their relations applied to axial, torsional, and flexural loads. Statically indeterminate axial members, beams, and shafts. Material properties, load classification and stability of columns. 5 lectures. Prerequisite: ME 211.

CE 208, 209 *Strength of Materials* (3) (3)

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 208: 3 lectures; CE 209: 2 lectures, 1 laboratory. Prerequisite: ME 211.

CE 221 *Introduction to Traffic Problems and Transportation* (4)

Elements of ground and water traffic circulation and planning, Driver and vehicle performance. Traffic analysis and control. Planning of air, water and ground transportation units and terminals as elements of complete transportation systems. 3 lecture-discussions, 1 laboratory. Prerequisite: MATH 141.

CE 228 *Civil Engineering Materials* (3)

Concepts of stress, strain, stress distribution. Engineering phenomena involving materials used in public works facilities. 2 lectures, 1 laboratory. Prerequisite: PHYS 133, CHEM 124, CE 207.

CE 229 *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 207.

CE 322, 323 *Structural Analysis* (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 208, 209.

CE 324 *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 lecture-discussions, 1 laboratory. Prerequisite: CE 221 or equivalent.

CE 325 *Public Works 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 323.

CE 326 *Drainage Systems* (3)

Application of rainfall intensity, frequency and duration statistics to design of drainage systems for transportation facilities. Procedures for sizing of storm sewers, culverts, inlets and bridges. Plan and specification preparation procedures. 2 lectures, 1 activity. Prerequisite: ME 341, CE 121.

CE 329 *Civil Engineering Materials* (3)

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. 1 lecture, 2 laboratories. Prerequisite: CE 208, 228.

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 417 Structural Dynamics (3)

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 3 lectures. Prerequisite: ME 316 or equivalent.

CE 421 Airfield and Highway Structures (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 lecture-discussions, 1 laboratory. Prerequisite: CE 329.

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 lecture-discussions, 1 laboratory. Prerequisite: CE 221, 329.

CE 423 Structural Steel Design (4)

Design and behavior of the elements of steel structures. Proportioning of members and connections. Introduction to plastic design. 2 lecture-discussions, 2 laboratories. Prerequisite: CE 323.

CE 433 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 lecture-discussions, 1 laboratory. Prerequisite: IE 414, CE 221, ECON 211.

CE 434 Public Transportation (3)

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. 2 lectures, 1 activity. Prerequisite: Senior standing or consent of instructor.

CE 435 Airport Planning and Design (3)

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. 2 lectures, 1 laboratory. Prerequisite: CE 221 or equivalent.

CE 437 Bituminous Materials and Mixtures (4)

Consideration of major types of bituminous materials—*asphalt cements, cutback asphalts, asphalt emulsions and tars.* Influence of chemical composition upon physical properties. Desirable aggregate characteristics for bituminous mixtures. Construction techniques for highways, airports, etc. Current practices for determining optimum asphalt contents. Design of bituminous mixes with evaluation methods, field testing plant control, etc. 3 lectures, 1 laboratory. Prerequisite: CE 228, 229.

CE 438 Public Works Contract Administration (3)

Legal aspects of public works contract documents, change orders, surety bonds, and contractual relationship between engineer-contractor, engineer-owner. Critical elements of project cost estimating on contracts for highway, airfield, and other public works construction. Theory of specification preparation, interfacing with OSHA, environmental considerations, cost accounting control. Labor provisions, resident engineer inspector responsibilities and authority and general project management techniques. 3 lectures. Prerequisite: Senior or graduate standing and consent of instructor.

CE 461, 462 Senior Project (2) (2)

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 120 hours total time Prerequisite: CE 421, 422.

CE 463 Undergraduate Seminar (2)

New developments, policies, practices, and procedures discussed in seminar sessions. Each individual is responsible for the development and effective presentation of topics in own area of emphasis. 2 meetings. Prerequisite: Senior standing.

CE 464 Professional Practice (3)

Basic elements of professional engineering practice. Professional ethics, procedures, contracts, specifications, cost estimating, and engineer-client relationship. 3 lectures. 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. One to three laboratories. Prerequisite: Consent of instructor.

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 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 lectures. Prerequisite: Graduate standing and consent of instructor.

CE 571 Transportation and Traffic Planning Models (3)

Development, analysis and discussion of applications of mathematical and schematic replicative, predictive and planning models in transportation and traffic engineering design problems. Selection of balanced transportation systems based on use of modal split and traffic models. 2 lectures, 1 activity. Prerequisite: ENGR 251, MATH 242, STAT 322, CE 433.

CE 572 Transportation Structural Models (3)

Principles of similitude; relationship to prototypes and experimental measurements of transportation structural models. 2 lectures, 1 activity. Prerequisite: CE 423 and 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 lectures. Prerequisite: Graduate standing or consent of instructor.

CE 574 Matrix Analysis of Public Works 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 322, 323; Graduate or senior standing.

CE 599 Design Project (3)

This course provides the opportunity for individual study/research leading toward a Master's thesis.

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 109 or equivalent.

CHEM 121 General Chemistry (4)

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 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

CHEM 122 General Chemistry (4)

Continuation of CHEM 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, non metals, 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 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

CHEM 124 General Chemistry (4)

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 students whose majors are in the School of Engineering and Technology. Not open to students with credit for CHEM 121 or 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

CHEM 125 General Chemistry (4)

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 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124.

CHEM 127 General Chemistry (4)

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 124. 3 lectures, 1 laboratory. Prerequisite: High school algebra and chemistry or CHEM 106.

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CHEM 128 General Chemistry (4)

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 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

CHEM 129 General Chemistry (4)

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 128, or consent of instructor.

CHEM 156 General Chemistry Laboratory (1)

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, 125, or 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 226 Survey of Organic Chemistry (4)

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, 125 or 128.

CHEM 252 Laboratory Glassblowing (1)

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 121, 124 or 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 226 or 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 371, PHYS 123 or 133, MATH 132 or 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 305; 328 or 371.

CHEM 305 Physical Chemistry (3)

Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or 133, CHEM 125 or 129, MATH 132 or 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 306 and 356, or consent of instructor.

CHEM 316 Organic Chemistry (4)

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, 125 or 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)

The chemistry of amines, aromatic compounds, heterocycles, macromolecules, some bi-molecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 317.

CHEM 328 Biochemistry (4)

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 226.

CHEM 331 Quantitative Analysis (5)

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 precipitation, 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 Quantitative Physiological 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 371, and 331.

CHEM 336 Quantitative Physiological 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)

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.

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CHEM 342 Environmental Chemistry II (3)

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 226 or 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.

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)

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 226 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)

An 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. Designed to be especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 328 or 371 or consent of instructor.

CHEM 378 Biochemical Pharmacology (3)

Consideration of principles governing drug absorption, distribution, metabolism, storage, excretion, dose-effect and structure-function relationships, with emphasis on sites and biochemical mechanisms of action. A brief summary of drug types and activity will be made. 3 lectures. Prerequisite: CHEM 317, 371 or consent of 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 and 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)

Chemical structure. Fundamentals of quantum chemistry, spectroscopy, and the electronic structure of atoms and molecules. Contemporary bonding theories. 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, 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 (4)

Optical, electroanalytical and other techniques of modern instrumental analysis. Current industrial applications. Laboratory work in instrumental methods is emphasized. 2 lectures, 2 laboratories. Prerequisite: CHEM 306, 331, 356 or CHEM 302, 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)

The 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 meetings. 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 305, or 317 or consent of instructor.

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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 Inorganic Chemistry (3)

Applications of electrode potentials to inorganic systems; nomenclature, bonding, stereochemistry, stability and reactions of coordination compounds; chemistry of the transition elements, lanthanides, organometallics and metal carbonyls; bioinorganic chemistry. 3 lectures. Prerequisite: CHEM 481.

CHEM 501 Physical Chemistry—Thermodynamics (3)

Fundamental theory and methods of thermodynamics, with application to the calculation of thermodynamic properties. 3 lectures. Prerequisite: CHEM 307, 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 lectures. Prerequisite: CHEM 405 or consent of instructor.

CHEM 503 Physical Chemistry—Kinetics (3)

Reaction rates and mechanisms of elementary processes; homogeneous and heterogeneous reactions and catalysis. 3 lectures. Prerequisite: CHEM 307, 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 lectures. Prerequisite: CHEM 318.

CHEM 515 Advanced Organic Chemistry—Mechanisms (3)

Mechanisms of pericyclic reactions; selection rules. Introduction to photochemistry; free radical reactions. 3 lectures. Prerequisite: CHEM 318.

CHEM 516 Advanced Organic Chemistry—Natural Products (3)

Structure determination and total synthesis of compounds of biological origin. 3 lectures. Prerequisite: CHEM 318.

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 577 Advanced Biochemistry (3)

Discussion format is emphasized, with examples drawn from current literature. Topics are selected from the following: control and regulation of the function and synthesis of nucleic acids and proteins, methods of physical analysis of macromolecules, molecular aspects of diseases, enzyme mechanisms. 3 lectures. Prerequisite: CHEM 302, 306 or 373, or consent of instructor.

CHEM 578 Advanced Biochemistry (3)

Food and nutritional aspects of biochemistry. Vitamins, amino acids, essential fatty acids, minerals, energy metabolism. Deficiency and degenerative diseases. Synthetic and imitation foods. 3 lectures. Prerequisite: A course in biochemistry.

CHEM 579 Advanced Biochemistry (3)

Discussion format is emphasized, with examples drawn from current literature. Topics selected from the following: membrane structure and function, hormone interactions, mitochondria structure and function, immunochemistry and neurochemistry. 3 lectures. Prerequisite: CHEM 372, 373, or consent of instructor.

CHEM 590 Graduate Seminar (1)

Presentation of advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics will vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 meeting. 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.

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 fishes 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. The 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 fishes 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 211 Introduction to Urbanization (3)**

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)

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. The 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 216 Computer Applications for Planning (1)

Introduction to the use of computer facilities and software programs with special applications for planners. 1 laboratory. Prerequisite: EDES 250 or equivalent.

CRP 218 Exploring Future Environments (3)

Current issues in environmental planning and environmental preservation. Survey and synthesis of environmental problems and decisions from the viewpoint of the various disciplines concerned with the trade-offs, conflicts, policy development and environmental management. 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 241 Environmental Analysis for Land Use Planning (2) (Also listed as LA 241)

Interpretation, reading and evaluation of land and terrain descriptions including maps, air photos, soil survey, hydrologic studies, contour and land form models, ERTS satellite and U2 panoramas, topographic quads and coordinate systems for use as data sources for land use planning related activities. 2 laboratories.

CRP 243 Urban Site Planning (3)

Designing urban neighborhoods, redesigning for Urban Renewal and creating new communities. 3 laboratories. Prerequisite: CRP 212.

CRP 347, 348, 349 Urban and Regional Design (3) (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 216, 243, 255.

CRP 351, 352, 353 Planning Laboratory (5) (5) (5)

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. 5 laboratories. Prerequisite: CRP 213, 216, STAT 252, CSC 255.

CRP 360 Urban Aesthetics (1-3)

Aesthetics as an important aspect of the physical and social organization of cities. Identification and 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 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 Environmental and Planning Regulations (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 425 Plan Implementation (3)

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. Prerequisite: CRP 353 or consent of instructor.

CRP 435 Transportation Theory (3)

The 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 451, 452, 453 Planning Laboratory (5) (5) (5)

Continuation of CRP 351, 352, 353. 5 laboratories. Prerequisite: CRP 349, 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 are presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours time. Prerequisite: CRP 349, 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 meetings. 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 501, 502 Foundations of Urban and Regional Planning (4) (4)

Evolution of the planning process. Techniques and approaches used in plan preparation within the context of changing rural and urban concerns. Land use, circulation systems, and open space planning. Regulatory and nonregulatory means for plan implementation. Planning and environmental law issues. 4 lectures.

CRP 505 Perspectives in Regional Planning (3)

History, development and major philosophical approaches of regional history, development and major philosophical approaches of 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 lectures. Prerequisite: Graduate standing or consent of instructor.

CRP 509 Planning Internship (2-6) (CR/NC)

Work experience as a supervised employee in a government or related agency as approved by the school dean. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Maximum 2 units/quarter except summer full-time internships. Credit limited to 6 units. Credit/No Credit grading. Prerequisite: Undergraduates, CRP 348, 352 and minimum GPA 2.5; graduate students, completion of 12 units of CRP courses including CRP 513, 515.

CRP 510 Contemporary Planning Theory (3)

Development of contemporary planning thought from historical roots. Intensive study of planning literature. Alternative value systems and planning processes. Current approaches and philosophies in the United States and other countries. 3 lectures.

CRP 511 Advanced Planning Theory (3)

Indepth study of selected problem-solving approaches and philosophies for planners in the analysis of social, technological, economic, and political trends. Emphasis on topics of current interest. 3 lectures. Prerequisite: CRP 510 or equivalent.

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 (3)

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 lectures. 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 lectures. Prerequisite: CRP 502 or equivalent.

CRP 530 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 standing 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 lectures.

CRP 552, 553 Planning Laboratory (5) (5)

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. 5 laboratories. Prerequisite: CRP 501, 513, 515.

CRP 554, 555 Advanced Planning Laboratory (5) (5)

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. 5 laboratories. Prerequisite: CRP 502 and 553 or equivalent, CRP 420, 510, 516, 548.

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 (6)

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Prerequisite: CRP 511, 516, 520, 555.

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.

CRSC 123 Forage Crops (4)

Production, harvest, and utilization of principal California forage crops. Identification and utilization of forage plants studied in the field. Field trips to local areas. 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 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 230.

CRSC 133 Row Crops (4)

Adaptation, production, processing, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets. A field trip to a major California row crop production area is 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.

294 CRSC

CRSC 230 General Field Crops (4)

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 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. 3 lectures, 1 laboratory. Prerequisite: CRSC 132 or 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 Agricultural Inspection (3)

Purpose and function of the State Department of Food and Agriculture, California Agriculture Code, and county departments of agriculture. Basic background to qualify students for the specific county inspector examinations. 2 lectures, 1 activity.

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)

Insecticide classification, insect toxicology, and resistance. Fate of pesticides in the environment. Alternate methods of insect control. Techniques of insect bioassay, insect and vertebrate toxicology, biological controls, insecticide residues. 3 lectures, 1 laboratory. Prerequisite: CRSC 311.

CRSC 322 Crop Technology (3)

Recent developments in technology relating to advancements in crop production and crop 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 325 Hay and Processed Forage Crops (3)

Intensive study of hay, dehydration and silage making procedures. Storage facilities, grades and market values, anti-oxidants and feed additives that affect bloat and feed quality. 2 lectures, 1 laboratory. Prerequisite: CHEM 121.

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 Management (4)

Identification, production, utilization of irrigated and nonirrigated pasture crops. A study of grazing systems and the merits of mixtures and nonmixtures. A field trip to a production area may be required. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230.

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 is 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 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 lay-out 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 are required. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, 221 and BOT 121.

CRSC 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.

CRSC 463 Undergraduate Seminar (2)

Oral presentation and leadership of group study on recent developments in the major field. 2 lectures.

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 lectures.

CSC—COMPUTER SCIENCE**CSC 101 Fortran Programming (2)**

Emphasis on programming techniques for mathematical analysis. Business and science applications. 2 lectures.

CSC 110 Computers and Computing (3)

Applications of computers. Impact of electronic computing and data processing on modern society. How computers are programmed. Using a timesharing computer to create and execute interactive programs. Survey of history and projections on future of computing. Credit not allowed for Computer Science majors. 3 lectures.

CSC 118 Fundamentals of Computer Science (3)

Introduction to problem solving methodology and computer science. Problem statements, solution procedures, algorithms, and computer programs. Problem solving using digital computers and campus computing facilities. 3 lectures.

CSC 120 Principles of Business Data Processing (3)

Fundamental concepts of programming. The BASIC language. Use of interactive terminals. Introduction to the COBOL language. Applications of computers to data processing problems. Uses of database systems to data processing applications. Primarily for Business majors. Credit not allowed for Computer Science majors. 3 lectures. Prerequisite: High school algebra.

CSC 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 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 118.

CSC 203 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 205 Programming Language/One (PL/1) (3)

Introductory and intermediate treatment of PL/1, its program formats, data forms, data transmission, internal manipulations, sequence control, and program organization. 3 lectures. Prerequisite: CSC 101 or 118 or equivalent.

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, 118, or 410 or consent of instructor.

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 118.

CSC 222 Digital Computer Symbolic Programming (3)

Advanced assembly language programming with emphasis on subroutine linkages and macrowriting. Introduction to I/O with emphasis on sequential files. 3 lectures. Prerequisite: CSC 221 and EL 219.

CSC 245 Discrete Structures (3) (Also listed as MATH 215)

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 221 or 306 or 309, CSC 345, EL 219.

CSC 306 Minicomputer Systems (3)

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. Prerequisite: CSC 118, EL 219.

CSC 309 Microcomputer Architecture and Software Development (4)

History and applications of microprocessors. Microprocessor architecture, programming and use of software development tools. 3 lectures, 1 laboratory. Prerequisite: CSC 118, EL 219.

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 apply to linear and nonlinear electrical systems. 3 lectures. Prerequisite: CSC 101, MATH 242, EE 212.

CSC 325 Job Control Language and Access Methods (3)

Job Control Language for the various configurations of System/360–370 Operating Systems. The creation and maintenance of physical sequential, indexed sequential, and direct data sets using the various System/360–370 basic and queued access methods. Introduction to the utility programs. 3 lectures. Prerequisite: CSC 222.

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 345 Data Structures (3)

Basic concepts of data structures: arrays, strings, simple linked structures, simple dynamic structures, internal sorting, binary trees, hashing. 3 lectures. Prerequisite: CSC 118, 245. CSC 222 recommended.

CSC 346 File Management (3)

Principles of file organization. Sequential, directory, hashed, and tree organized files. File handling utilities. Modern types of mass storage media. Systems of files. Selected case studies and applications. 3 lectures. Prerequisite: CSC 345.

CSC 350 Systems Analysis (3)

Analysis of administrative and management problems to develop understanding and improved solutions through application of computers. Computer simulation and modeling of discrete systems involving stochastic variables. 3 lectures. Prerequisite: Knowledge of Fortran programming, and STAT 211 or 321.

CSC 351 Programming Languages (4)

Formal languages, run time representation, structure of algorithmic languages, parameter passing between routines, storage allocation and mapping, and binding time. Adaptability of selected languages to various fields of application and language extensibility. 4 lectures. Prerequisite: CSC 222, 345.

CSC 353 Computer Systems Programming (3)

Design of assemblers, macroprocessors, and loaders. Advanced macrowriting and I/O programming. 3 lectures. Prerequisite: CSC 222, 345.

CSC 360 Computer Simulation (3)

Computer simulation and modeling of continuous systems. Applications to problems of design, analysis, and control. 3 lectures. Prerequisite: MATH 133 or 242 and knowledge of Fortran programming.

CSC 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 not more than 2 units in any one quarter. Credit/No Credit grading. 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 or consent of instructor.

CSC 409 Microcomputer Systems (4)

Continuation of CSC 309. Application programming, high level languages, and interfacing microprocessors. An introduction to 16-bit and microprogrammable processors. 3 lectures, 1 laboratory. Prerequisite: CSC 309 or consent of instructor.

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 412 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 410 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 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 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 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 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 451 Compilers and Interpreters (3)

Syntactic and semantic analysis. Intermediate translation forms. Generation of object code for compilers. Interpreter design. 3 lectures. Prerequisite: CSC 351.

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, 346, 353.

CSC 454 Operating System Implementation (3)

Implementation of operating systems and operating systems modules. Measurement of operating system performance parameters. 3 lectures. Prerequisite: 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 (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.

CSC 463 Undergraduate Seminar (2) (CR/NC)

Reports and discussions by students through seminar methods, 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.

300 CSC

CSC 519 Computer Modeling and Simulation I (4)

Computational aspects of computer algorithms for computer modeling and simulation. High level languages for computer simulation. 4 lectures. Prerequisite: Knowledge of Fortran programming, MATH 133 or 242, STAT 321, CSC 319 and 350.

CSC 520 Computer Modeling and Simulation II (4)

Simulation methodology, simulation languages and applications of simulation in several applied areas. 4 lectures. 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 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 lectures. Prerequisite: CSC 333.

CSC 541 Information Processing (4)

Algorithm design and evaluation, advanced data structures, language structure, string manipulation, network and graph theoretic methods of analysis, file organization and management, internal and external sorting methods. 4 lectures. Prerequisite: CSC 304, 346.

CSC 542 Information Processing (4)

Design and implementation of database management systems; architecture of database machines; techniques for reliability, protection, and integrity in database systems. Principles of system analysis; design, modularity, and interfacing; the systems development cycle. 4 lectures. Prerequisite: CSC 541, 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 lectures. 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 lectures. 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 lecture, 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 topics for selection. Topic credit limited to 9 units. 1 to 3 lectures. 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 meetings. 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.

CSTR—CONSTRUCTION**CSTR 233 Project Drawings (3)**

Introduction to construction working drawings and shop drawings. 1 lecture, 2 laboratories. Prerequisite: ARCH 232.

CSTR 240 Construction Laboratory (1–2)

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

CSTR 317 History of Construction (3)

Development of construction techniques and building science. Effects of scientific and engineering advancements on construction theory. The constructor as a member of the building team and as consultant to the architect, planner, and structural engineer. 3 lectures. Prerequisite: Third-year standing.

CSTR 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, 301.

CSTR 322 Concrete Formwork Design (2)

Design, construction and economics of concrete formwork. Use of wood, steel, plastic and other formwork systems. Applications to special situations and techniques including precast and prestressed concrete. 1 lecture, 1 laboratory. Prerequisite: ARCE 321, 322.

CSTR 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.

CSTR 332 Cost Alternatives Evaluation (3)

Basic principles of economic evaluations between cost alternatives. 3 lectures. Prerequisite: Third-year standing in Construction.

CSTR 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, CSTR 233, ARCE 223.

CSTR 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, CSTR 233, ARCE 223.

CSTR 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, CSTR 233, ARCE 223.

CSTR 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.

CSTR 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.

302 CSTR

CSTR 411 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.

CSTR 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.

CSTR 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. 1 lecture, 1 laboratory. Prerequisite: Fourth-year standing.

CSTR 427 Construction Practices and Procedures (2)

Introduction to construction practices and procedures, including planning, scheduling, estimating and cost analysis, and contract administration. For nonmajors. 2 lectures. Prerequisite: Third-year standing.

CSTR 433 Construction Planning and Control (2)

Introduction to Critical Path Method, PERT and other systems of construction planning and control. Graphic representation and computer applications. For students not majoring in Construction. 1 lecture, 1 laboratory. Prerequisite: EDES 250, fourth-year standing.

CSTR 441 Civil Works Estimating (2)

Procedures for estimating costs of civil works. 2 activities. Prerequisite: CSTR 341, 342, 343.

CSTR 442 Building Estimating (2)

Procedures for estimating costs of buildings. 2 activities. Prerequisite: CSTR 341, 342, 343.

CSTR 443 Mechanical Systems Principles (2)

Selection, estimating and installation of mechanical systems. 2 activities. Prerequisite: CSTR 233, ARCH 308, 309.

CSTR 451 Heavy Construction (5)

Methods and procedures used on heavy construction projects. 5 laboratories. Prerequisite: CSTR 341, 342, 343.

CSTR 452 Project Controls (5)

Planning, organization, scheduling, and control of construction projects. 5 laboratories. Prerequisite: CSTR 341, 342, 343.

CSTR 453 Project Development (5)

Methods and procedures used in the development of a residential, commercial, or industrial project. 5 laboratories. Prerequisite: CSTR 341, 342, 343.

CSTR 461, 462 Senior Project (2) (2) (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. 120 hours minimum total time. Credit/No Credit grading only. Prerequisite: CSTR 343.

CSTR 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.

CSTR 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.

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 introductory dairy course. 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, 121, 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)

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. A general 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 (2)

Nutrition requirements of dairy cattle. Successful, economical feeding practices, ration formulation utilizing the computer and desk calculators. 2 lectures. Prerequisite: DH 102.

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, 222.

304 DH—DM

DH 330 Artificial Insemination (2)

Techniques in the collection, evaluation, processing, storage and shipment of semen. Insemination procedures. Fertility problems. Record keeping. 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, 323, 330, and 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. Late 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 Market Milk (4)

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. 3 lectures, 1 laboratory. Prerequisite: DH 121.

DM 202 Dairy and Poultry Product Merchandising (3)

Product promotion, advertising, merchandising. State and national programs. Independent advertising and sales promotion programs. 3 lectures.

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)

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, 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 431 Dairy Plant Management (4)

Basic management principles applied to the Dairy Industry. Industrial organization and control. Dairy plant location, design facilities and layout. Elements of successful salesmanship, advertising, and marketing. Survey of overhead allocation and of financing and depreciation applied to the dairy industry. Study of significant operating ratios and comparative analysis of financial statements. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

DM 433 Dairy Equipment and Systems (4)

Maintenance and minor repair of vacuum pumps, milk pumps, conveyor and product handling systems, and other specialized equipment. 3 lectures, 1 laboratory. Prerequisite: DM 133 and junior standing.

ECON—ECONOMICS**ECON 101 Introduction to Economics (2)**

The scope and methods of economic science, with emphasis on the relevance of economics to the overall functioning of society. 2 lectures.

ECON 105 Consumer Economics (3)

Consumer-producer relationships, money management, buying methods; investments, insurance, and housing; agencies that help the consumer. 3 lectures.

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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)

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 Freshman Composition recommended.

ECON 211 Principles of Economics (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 English composition 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 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 English recommended.

ECON 222 Macroeconomics (4)

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 English 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 221 or consent of instructor.

ECON 304 Comparative Economic Systems (3)

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 (3)

Causes and measurement of business fluctuations. Techniques of forecasting. 3 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, 222 or equivalent; STAT 251, 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, 222 or equivalent; STAT 251, 252 or equivalent; ECON 337.

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, 212 or ECON 221, 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)

Economic development: the less developed world and the American interest. 3 lectures. Prerequisite: One course in principles of economics.

ECON 334 Urban Economics (3)

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. 3 lectures. Prerequisite: One course in principles of economics.

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 macroeconomics.

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 143 or 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 (3)

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. 3 lectures. Prerequisite: ECON 211, 212 or ECON 221, 222 or consent of instructor.

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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, 212 or ECON 221, 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 221 or consent of instructor.

ECON 404 International Monetary Economics (3)

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. 3 lectures. Prerequisite: ECON 211, 212 or ECON 221, 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 212; 311, 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 221 or consent of instructor.

ECON 414 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 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 (3)

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. 3 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. 3 meetings. 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 203 Efficient Reading (2) (CR/NC)**

Development of reading efficiency required in modern business, industry, and the professions. 1 lecture, 1 activity. Credit/No Credit grading only.

ED 301 Multicultural Education in Public Schools (3)

Multicultural factors that influence learning in the public schools; professional responsibilities and legal requirements in the profession. 2 lectures; 1 activity. Prerequisite: Junior standing or consent of instructor.

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 335 The Learning Process (3)

How and why students learn in school, motivation and classroom behavior, nature of the learning process and human development. Self evaluation of the prospective teacher. 3 lectures.

ED 415 Early Childhood Interventions (3)

Significant early elementary school intervention programs, their philosophies and organizational designs. Study of educational needs, behavior and development of kindergarten and primary age children with regard to effect on readiness for learning. 3 lectures.

ED 424 Organizing and Teaching Multiple Subjects (3)

Introduction to the organization, selection, presentation, application, and interpretation of subject matter in the basic curriculum areas. Course designed for students who will be teaching in elementary schools. 3 activities. Prerequisite: ED 438. Taken concurrently with ED 430.

ED 430 Preliminary Student Teaching (6)

Part-time assignment usually prior to ED 440. Includes participation, teaching and allied activities under direction of a selected regular teacher in consultation with a university supervisor. Application for student teaching must be approved prior to enrollment. A grade below "C" is unacceptable for recommendation for a credential. Prerequisite: Admission to teacher preparation program.

ED 434 Field Experience in Reading Methods (2)

Supervised field experience in the teaching of reading in a school setting. Seminars relating to instructional procedures. Prerequisite: Advanced standing.

ED 435 Methods of Teaching Reading (3)

Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the classroom. 3 lectures. Prerequisite: ED 434.

ED 436 Diagnosis, Prescription and Evaluation (2)

Diagnosis of student learning problems. Prescription and direction of student learning programs. Evaluation of student achievement. 1 lecture, 1 activity.

ED 438 Instructional Processes (3)

Development of skills in classroom communication, planning instruction, selection and use of instructional materials. Teaching strategies, guiding discussion, promoting critical thinking, problem-solving, effective questioning, creating a learning environment. Examination of various types of classroom organization. 3 activities. Prerequisite: Admission to teacher education program or consent of instructor.

ED 439 Supervised School Experience (2-4) (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 440 Student Teaching (12)

Full-time assignment usually preceded by ED 430. Includes teaching and allied responsibilities under direction of a selected regular teacher in consultation with a university supervisor. Application for student teaching must be approved prior to enrollment. A grade below "C" is unacceptable for recommendation for a credential. Prerequisite: Admission to teacher preparation program.

ED 441 Student Teaching Practicum (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 442 Curriculum and Methods for Early Elementary Teachers (3)

Objectives, methods, curriculum, acquisition of appropriate materials, and construction of instructional aids. 2 lectures, 1 activity. Prerequisite: ED 415 or consent of instructor.

ED 443 Curriculum and Methods in Elementary School Language Arts (3)

Methods and materials for teaching grammar and usage, spelling, handwriting, listening, speaking, researching and reporting skills, and creative writing. 3 lectures.

ED 444 Curriculum and Methods in Elementary School Science (3)

Curriculum, methods, and teaching procedures in elementary school science. The California Science Program. 3 lectures. Prerequisite: Advanced standing and approval of credential adviser.

ED 445 Curriculum and Methods in Elementary School Social Studies (3)

Curriculum, methods, and teaching procedures in elementary school social studies with emphasis on the California program. 3 lectures. Prerequisite: Advanced standing and approval of credential adviser.

ED 451 Senior Project—Practicum (3)

Analysis of practices and problems of student teaching. Taken concurrently with ED 440. Limited to B.A. in Liberal Studies credential candidates. Written paper or report required. 2 lectures, 1 activity.

ED 457 Leisure Counseling (3) (Also listed as PSY 457 and 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.

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 480 Problems of Exceptional Children (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 481 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 lectures. Prerequisite: ED 480 and admission to Special Education Program, or consent of instructor.

ED 482 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 lectures.

ED 483 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 lectures.

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 the department head, the graduate major adviser and the supervising faculty member.

ED 501 Philosophy of Education (3)

The function of philosophy; the meaning of education; significance of present philosophical points of view; education aims and values; democracy and education; the relationship of various philosophical outlooks to educational methods and subject matter. 3 lectures.

ED 503 Guidance Services (3)

Philosophy and concepts and underlying guidance services. Procedures, techniques, and materials employed by counselors, teachers and others in meeting individual student needs. 3 lectures. Prerequisite: PSY 201 or 202.

ED 505 Minority Student Counseling and Guidance (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 lectures. Prerequisite: ED 503, PSY 454.

ED 507 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 508 Educational Sociology (3)

Sociological backgrounds of school children; effects of social, economic, and political trends and issues on education; problems of leisure, recreation, and occupations; modern interpretations of democratic ideology. Sociological problems are utilized to define the social objectives of the school. 3 lectures.

ED 509 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 lectures. Prerequisite: Admission to Special Education Program or consent of instructor.

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 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 lectures. Prerequisite: ED 434.

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 community action between educational institutions and their respective publics. Establishing working relationships with other educational institutions; children and youth; parents and home neighborhoods; and politics and community power structures. Cooperative efforts in resolving contemporary urban and rural community problems. 3 lectures.

ED 518 Diagnosing Reading Problems (3)

Formal and informal methods of diagnosing reading problems in classrooms and reading clinics. 3 lectures. Prerequisite: ED 434, 435, 440, or consent of instructor.

ED 519 Teaching the Gifted Child (3)

The nature of the growth and development of gifted children, including physical, social, and achievement aspects. Methods of identifying giftedness, gifted children, and children with special abilities. Study of selected programs for teaching gifted children in California and other states. 3 lectures.

ED 520 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 434, 435 or consent of instructor.

ED 521 Teaching the Culturally Different (3)

Cultural factors that inhibit learning in the school; problems and needs of the disadvantaged child; classroom procedure and materials to facilitate learning and increase educational achievement; preparation for teaching in depressed areas. 3 lectures. Prerequisite: Graduate standing.

ED 522 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 434, 435, or consent of instructor.

ED 523 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 lectures. Prerequisite: Admission to Special Education Program or consent of instructor.

ED 524 Investigative Techniques (3)

Principles and methods of planning a research proposal in educational and related community settings with emphasis on educational data and analysis techniques. 3 lectures. Prerequisite: One college level math course, PSY 201 or 202.

ED 525 Group Guidance and Counseling (3)

A study of group counseling research, techniques and evaluation with emphasis on practical application in educational and community settings. 3 lectures. Prerequisite: ED 503.

ED 526 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 518 and consent of instructor.

ED 527 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 lectures. Prerequisite: ED 480 and 481.

ED 528 Advanced Counseling Critique (3)

Advanced practice in career, personal, and educational counseling. Counseling theory and procedure, educational and career planning. Application of theory to practical counseling situations. 3 lectures. Prerequisite: ED 503.

ED 529 Supervision of Vocational and Practical Arts Education (3)

Methods of designing and implementing programs of vocational and practical arts education (applied arts) including agriculture, business, diversified cooperative, distributive, work experience education, homemaking, industrial arts, and trade technical education. 3 lectures.

ED 531 Information Systems in Education (3)

Use of information systems in education and related areas resulting in presentation of a project. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

ED 532 Group Processes in Education (3)

A study of 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 533 Advanced Learning Processes (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 335, equivalent course, Master's degree candidate or consent of instructor.

ED 534 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 538 Career Development of Exceptional Persons (4)

Career selection, preparation and social adjustment, community attitudes and legal requirements for individuals with handicapping conditions. Observation and fieldwork required. 3 lectures, 1 activity. Prerequisite: ED 480 or consent of instructor.

ED 539 Educational, Occupational and Community Information (3)

Collecting occupational, educational and community information including community resources such as agencies and organizations that provide services to individuals or groups. Sources and techniques of collecting and imparting such information stressed. 3 lectures. Prerequisite: ED 503.

ED 540 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 lectures. Prerequisite: ED 503.

ED 541 Administration of Pupil Personnel Services (3)

Organization of pupil personnel services programs, their administration, their evaluation. Use of community resources and a study of laws relating to children and child welfare. 3 lectures. Prerequisite: ED 503.

ED 542 Gender Stereotyping in Education (3)

Sex role stereotyping in public schools and related community agencies; issues, career planning, decision making, legal considerations, and the developmental process. 3 lectures.

ED 543 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 concern, ethics and law. Prerequisite: CD 450, ED 503.

ED 545 Practicum in Counseling, Supervised Experience (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 503.

ED 546 Supervised Field Experience, Guidance and Counseling (3-12)

Practical application of guidance services and counseling in public schools, colleges, and related community settings. Weekly seminars with University staff included. Prerequisite: Consent of Pupil Personnel Services Committee one quarter prior to enrollment.

ED 550 Career Education (3)

Curriculum and purpose of career education in elementary and secondary schools and higher education. 3 lectures.

ED 564 Reading Process (3)

Physiological, psychological and psycholinguistic components of the reading process. 3 lectures. Prerequisite: ED 434, 435.

ED 566 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 518.

ED 570 Classroom Management Strategies (3)

Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. 3 lectures. Prerequisite: Student teaching.

ED 580 Advanced Clinical Experience in Special Education (6)

Clinical experience with individuals with exceptional needs. Directed teaching activities with students 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 481, 509, 566, SP 512, PSY 446.

ED 581 Graduate Seminar in Education (1-3)

Group study of contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

ED 588 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 12 units. Prerequisite: 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 (1-2)

Exercises in drawing without mechanical aids. Total credit limited to 3 units. 1-2 laboratories.

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, 111.

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, 203 Environmental Design Fundamentals (3) (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. Field trip required. 3 laboratories. Prerequisite: EDES 101, 112.

EDES 210 Advanced Descriptive Drawing (2)

Advanced programs in descriptive drawing as continuation of EDES 110. 2 laboratories.

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EDES 213 Principles of Site Analysis (3)

Introduction and application of selected inventory and analysis techniques through literature survey and exercises at several scales. Limited sites to regional. 3 lectures. Prerequisite: ENGL 104.

EDES 250 Digital Computer Applications (2)

Introduction to the application of batch-processing, time-sharing and computer graphics in environmental design. 1 lecture, 1 laboratory.

EDES 301 Environmental Impact Reporting (3)

Systematic and interdisciplinary methodologies for information gathering 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.

EDES 304 Human Factors for Environmental Designers (3)

Development of human factors based on urban design criteria. Identifying and interpreting client/user needs, expectations and requirements. Application of interview, questionnaire and survey methods to environmental, sociocultural and adaptive processes. 3 lectures. Prerequisite: EDES 303 or consent of instructor.

EDES 319 Human Performance in the Built Environment (3)

Assessment and measurement of the relationships between design, methods of construction, cost and manpower utilization. Design and construction of structures for minimum cost consistent with intended function. Materials selection and construction processes related to minimum man-hours and nonspecialized labor skills. 3 lectures. Prerequisite: Third-year standing in the School of Architecture and Environmental Design.

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 d.c., 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)

A continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, phasors, a.c. 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 231 Electric Machines (3)

Operational and application characteristics of the more common types of a.c. and d.c. machines and transformers. Not for engineering majors. 3 lectures. Prerequisite: PHYS 123, MATH 133, ETEL 126 or equivalent.

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, 212.

EE 261 Electric Circuits Laboratory (1)

Techniques of measurement of d.c. and steady-state a.c., circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 201.

EE 271 Electric Machines Lab (1)

Transformers, d.c. and a.c. rotating machines and evaluation of operating characteristics of these devices. 1 laboratory. Concurrent or prerequisite: EE 231.

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 318.

EE 302 Linear Control Systems (3)

Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EL 301, 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)

The fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, d.c. machines and a.c. induction machines. 3 lectures. Prerequisite: EE 201 or 212.

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, 341, 365.

EE 343 Power Transmission Laboratory (1)

Analysis of power transmission lines and power networks by modeling them on digital computers and an analog analyzer. Numerical experiments conducted in this laboratory will be closely coordinated with EE 303. Digital computer experiments are individually performed, analyzer experiments are performed in groups of two on a self-paced schedule. The analyzer laboratory is open from 8:00 to 5:00 weekdays and students can use the laboratory any time it is available. 1 laboratory. Concurrent or prerequisite: EE 303.

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. 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. 4 lectures. Prerequisite: EE 406.

EE 410 Power Control I (4)

Power semiconductor devices. Theory of power diodes, SCR, Triac, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and d.c. 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. 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. Unbalanced operations. 3 lectures, 1 laboratory. Prerequisite: EE 325, 365.

EE 432 Control Systems Engineering (3)

An 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, EL 309 or consent of instructor.

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. 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 meetings. 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. One to three 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 lectures. Prerequisite: EE 325 or equivalent.

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. Stability by Lyapunov's functions. Adaptive and optimal control. Bellman's dynamic programming and Pontriagin's maximum principle. Random processes, and stochastic control. 3 lectures. Prerequisite: EE 302 or equivalent and consent of the 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 lectures. Prerequisite: EE 406 or equivalent.

EE 519 Power System Design (4)

Design studies involving aspects of an electric power system. Current industrial designs. Simulation techniques used extensively. 4 lectures. Prerequisite: ENGR 518.

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, Marhov and Semi-Marhov 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 lectures. Prerequisite: EL 414 or equivalent and 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 lectures. Prerequisite: EE 301 or equivalent and consent of instructor.

EE 563 Graduate Seminar (1)

Discussion of 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. 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 with electrical and electronic engineering background and selected seniors. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EE 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.

EL—ELECTRONIC ENGINEERING**EL 111 Introduction to Electronic Instrumentation (2)**

Fundamental electrical measurement techniques and operation of laboratory test equipment. Use of meters, signal sources, oscilloscopes and power supplies. 1 lecture, 1 two-hour laboratory.

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)

The 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)

Introductory physical study and analysis of various solid-state electronic devices, with emphasis on p-n junction diodes, transistors (bipolars, FET's and MOSFET's), SCR's and optical devices (LED's and phototransistors), their internal operation, terminal characteristics, fabrication techniques and applications. 3 lectures. Prerequisite: Sophomore standing.

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. Introduction to state machine analysis. 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 305 Introduction to Digital Circuits (4)

Solid-state devices and circuits used in digital computer electronics. Diode and transistor switching action, operation of multivibrators (flip-flop) circuits. Integrated circuit fabrication and operation. For Computer Science majors. 3 lectures, 1 laboratory. Prerequisite: PHYS 133, EL 219.

EL 307 Digital Integrated Electronics (3)

Integrated logic circuits: RTL, DTL, TTL, PL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EL 208, 219.

EL 308 Electronic Circuits (3)

Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EL 208, EE 302 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.

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. The 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 (4)

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, 1 laboratory. Prerequisite: Junior standing in Engineering or Computer Science or consent of instructor.

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 318, 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. Concurrent or prerequisite: EL 219, 307.

EL 348 Electronic Circuits Laboratory (1)

Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Concurrent or prerequisite: EL 308.

EL 349 Integrated Electronic Circuits Laboratory (1)

Design of electronic subsystems using integrated circuits. 1 laboratory. Concurrent or prerequisite: 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 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 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, 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, 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 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 Signal Processing in Communications (3)

Analog modulation, digital modulation, random variables and random processes in linear systems, signal detection and estimation. 3 lectures. Prerequisite: 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. The 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; controlled source variable-gain, infinite-gain, gyrator, and state-variable realizations; sensitivity analysis and consideration; and applied synthesis techniques 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 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, 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.

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, 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, 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. Projects results are presented in a formal report. Minimum 120 hours total time. Prerequisite: EE 325, EL 309, 319, 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 lectures. 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 Digital Filtering (3)

Z-transform. Frequency domain design of digital filters. Two-dimensional digital filtering with applications to x-ray enhancement, image deblurring, scene analysis, processing of radar and sonar arrays. Fast Fourier transform. Hardware for digital filtering. 3 lectures. Prerequisite: EL 411 or 425 and consent of instructor.

EL 517 Information Theory (3)

An 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 lectures. 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 lectures. 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 lectures. 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 lectures, 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 lectures. Prerequisite: PHYS 412 or equivalent.

EL 526 Modern Communication Theory (3)

Introduction to modern communication theory. Representation of random signals, signal detection and selection, estimation of signal parameters and modulation. Optimum receiver principles, application to digital communications and radar systems. 3 lectures. Prerequisite: EL 401, 414, and consent of instructor.

EL 528 Systems Design (1-3)

Application of engineering systems and analysis to design problems. Creative thinking emphasized. Group and individual assignments. Open to graduate students in EL concentration.

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 lectures. Prerequisite: EL 401, PHYS 412 or equivalent and consent of instructor.

ENGL—ENGLISH

ENGL 100 Fundamentals of Writing: Spelling and Vocabulary (2) (CR/NC)

Practice in grouping words according to similar spelling patterns and in remembering those with low predictability. Vocabulary expanded through studying structured writing assignments. Concurrent enrollment in Writing Workshop recommended (ENGL 103). Repeatable. 2 lectures. Credit/No Credit grading only.

ENGL 101 Fundamentals of Writing: Sentence Construction (2) (CR/NC)

Practice in writing sentences which express meaning clearly and correctly. Instruction and drill in using words precisely, in removing ambiguity, in using conjunctions as logical connectors, and in following such conventions of Standard Written English as clear pronoun reference and appropriate sequence of tenses. Concurrent enrollment in Writing Workshop recommended (ENGL 103). Repeatable. 2 lectures. Credit/No Credit grading only.

ENGL 102 Fundamentals of Writing: Logic and Organization (2) (CR/NC)

Practice in recognizing relationships between ideas and in understanding the aim and organization of paragraphs. Instruction and practice in focusing paragraphs, ordering ideas logically, and supporting them convincingly. Concurrent enrollment in Writing Workshop recommended (ENGL 103). Repeatable. 2 lectures. Credit/No Credit grading only.

ENGL 103 Writing Workshop (2) (CR/NC)

Recommended for all students enrolled in ENGL 100, 101, and 102. Individualized tutorial help for students completing writing projects which utilize skills being studied in fundamental courses. Repeatable. 2 lectures. Credit/No Credit grading only.

ENGL 104 Freshman Composition (3)

Practical study and application of techniques of exposition. Critical reading of model essays. Frequent writing assignments. 3 lectures.

ENGL 105 Freshman Composition (3)

Practical study and application of persuasion and argument. Introduction to library research. Less frequent but more intensive writing assignments culminating in an original research paper. Readings for critical analysis. 3 lectures. Prerequisite: ENGL 104.

ENGL 106 Intensive Composition (4)

Instruction in generating sentences that express meaning clearly and correctly. Practice aimed specifically at mastering inflections, the tense system, and basic sentence patterns. Frequent short writing assignments. Prepares students for ENGL 107. Repeatable. 4 lectures.

ENGL 107 Intensive Composition (4)

Continued instruction in basic mechanics, with increased attention to sustaining and developing thought in longer units of discourse. Analysis of readings to familiarize students with formal discourse. Prepares students for ENGL 114. Repeatable. 4 lectures.

ENGL 110 Intensive English (4)

For the nonnative speaker of standard English who needs additional work with English as a foreign language. Practice in pronunciation, sentence structure, reading, and composition. Individual work in the language laboratory. 4 two-hour laboratories.

ENGL 114 English Composition (4)

Practical study and application of techniques of exposition. Critical reading of model essays. Frequent writing assignments. Not open to students with credit in ENGL 104. 4 lectures.

ENGL 115 English Composition (4)

Practical study and application of persuasion and argument. Introduction to library research. Less frequent but more intensive writing assignments than in ENGL 114 culminating in an original research paper. Readings for critical analysis. 4 lectures. Prerequisite: ENGL 114. Not open to students with credit in ENGL 105.

ENGL 204 Introduction to Literary Types (4)

Understanding the elements of fiction, drama, and poetry through guided discussion of significant examples of each of the major types. Credit not allowed for both ENGL 204 and ENGL 207. 4 lectures. Prerequisite: One composition course.

ENGL 207 Introduction to Literature (3)

Introduction to major forms of literature. Study of selected works with reading for appreciation. May not be elected by English majors. Credit not allowed for both ENGL 204 and 207. 3 lectures. Prerequisite: ENGL 104 or 114.

ENGL 218 Report Writing (3)

Forms of communication used in science and industry. Letters, reports, proposals, and articles. Extensive writing practice. 3 lectures. Prerequisite: One composition course.

ENGL 219 Technical Writing (3)

Content, style, design, and production of communications such as data sheets, manuals, brochures, news releases, and advertisements. Extensive writing and editing. 3 lectures. Prerequisite: One composition course.

ENGL 233 Introduction to Shakespeare (3)

Selected readings in Shakespeare. Course is designed for General Education. 3 lectures. Prerequisite: ENGL 104 or 114.

ENGL 240 Introduction to American Literature (4)

Literary perspectives on the American experience through selected readings from representative American authors. May not be elected by English majors. Not open for credit to students with credit in ENGL 340, 341 or 342. 4 lectures. Prerequisite: ENGL 104 or 114.

ENGL 251, 252, 253 Great Books of the Western World (3) (3) (3)

Selected readings in European literature from the Greeks and Romans to the present. Course designed for General Education. 3 lectures. Prerequisite: ENGL 104 or 114.

ENGL 254 Twentieth Century Literature (3)

Readings in the literature of the modern period; significant writers and their literary achievements; relationships to prevailing twentieth century modes of thought. Open to majors and nonmajors. 3 lectures. Prerequisite: ENGL 204 or 207 or 240. Repeatable to 9 units under different subtitles.

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.

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.

ENGL 270 Introduction to Cinema (4)

Stylistic and historical developments. The film art studied through readings, lectures, viewing, and appraisal of landmarks of international cinema. 3 lectures, 1 activity. Prerequisite: One sophomore literature course.

ENGL 271 Film Styles and Traditions (4)

A close examination of a single cinematic style or tradition (neo-realism, western) with emphasis on how major film makers modify and manipulate artistic conventions. 3 lectures, 1 activity. Prerequisite: One literature course.

ENGL 280 Afro-American Literature (4)

Selected readings in Afro-American literature. 4 lectures. Prerequisite: ENGL 114.

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ENGL 281 Mexican-American Literature (4)

Selected readings in Mexican-American literature in translation. 4 lectures. Prerequisite: ENGL 114.

ENGL 290 Introduction to Linguistics (4)

Overview of linguistics from its origin to present forms and practices. 4 lectures. Prerequisite: ENGL 104 or 114.

ENGL 300 Advanced Composition (3)

Application of grammatical and rhetorical principles to writing. Production of clear, well-planned, effective prose. 3 lectures.

ENGL 304 Advanced Composition—Nonfiction (4)

Instruction and practice in writing, revising, and evaluating various forms of nonfiction. 4 lectures. Prerequisite: One composition course.

ENGL 310 Corporate Communication (3)

Instruction and practice in forms of communication characteristic of business and industry. 3 lectures. Prerequisite: ENGL 104 or 114.

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 115.

ENGL 325 Creative Writing (4)

Instruction and practice in the writing, revising, and evaluating of fiction, poetry, or drama. 4 lectures. Prerequisite: ENGL 115. Repeatable to 8 units.

ENGL 326 Literary Criticism (4)

Instruction and practice in writing, revising, and evaluating various kinds of critical writing. 4 lectures. Prerequisite: ENGL 114.

ENGL 330 British Literature: Medieval Period (4)

Major prose, poetry and drama of the Old and Middle English periods in modern translations, including Beowulf and Chaucer. 4 lectures.

ENGL 331 British Literature: The Renaissance (4)

Major Elizabethan and Jacobean prose, poetry, and drama, including works of Jonson, Donne, and Milton. 4 lectures.

ENGL 332 British Literature: The Enlightenment (4)

Major prose, poetry, and drama from 1660 to 1800, including works of Dryden, Swift, Pope, and Johnson. 4 lectures.

ENGL 333 British Literature: The Romantic Movement (4)

Major prose, poetry, and drama from 1798 to 1832 including works of Wordsworth, Coleridge, Byron, Shelley, and Keats. 4 lectures.

ENGL 334 British Literature: The Victorians (4)

Major prose, poetry, and drama from 1832 to 1901 including works of Tennyson, Browning, and Arnold. 4 lectures.

ENGL 340 American Literature to 1860 (4)

Selected major prose and poetry of American literature to 1860. 4 lectures.

ENGL 341 American Literature 1860–1914 (4)

Selected major prose and poetry of American literature 1860–1914. 4 lectures.

ENGL 342 American Literature 1914 to the present (4)

Selected major prose, poetry, drama of American literature 1914 to the present. 4 lectures.

ENGL 350 Modern Novel (4)

Readings in representative 20th century novels with special emphasis on origins, form, style, and ideas. 4 lectures. Prerequisite: ENGL 204.

ENGL 351 Modern Poetry (4)

Representative 20th century poets. 4 lectures. Prerequisite: ENGL 204.

ENGL 352 Modern Drama (4)

British and American drama of the 20th century. 4 lectures. Prerequisite: ENGL 204.

ENGL 360 Literature for Adolescents (3)

Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: ENGL 104 or 114.

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: One composition course.

ENGL 392 Contemporary Grammar and Composition (4)

English grammar and composition in elementary school programs. Vocabulary, word order, sentence structure, idea development, standards for spelling, punctuation, and composition form. 4 lectures. Prerequisite: ENGL 115 or equivalent.

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 115.

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 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 115 and SP 317, or SP 318.

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 331, or 332, or 333, or 334.

ENGL 431 Shakespeare (4)

A study of representative comedies, tragedies, and histories. 4 lectures. Prerequisite: ENGL 330, or 331, or 332, or 333, or 334.

ENGL 432 Milton (4)

A study of *Comus*, *Lycidas*, *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 lectures. Prerequisite: ENGL 330, or 331, or 332, or 333, or 334.

ENGL 439 Significant British Writers (4)

Study of 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 331, or 332, or 333, or 334.

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ENGL 449 Significant American Writers (4)

Study of 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 341, or 342.

ENGL 459 Significant World Writers (4)

Study of 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. 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. 4 lectures. Prerequisite: ENGL 390 or consent of instructor.

ENGL 502 Introduction to Critical Analysis (3)

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. 3 lectures. Prerequisite: Graduate standing.

ENGL 503 Contemporary Language Study (3)

Correlation between current development of English language and courses in grammar and composition in public schools. Usage, vocabulary, spelling, idiom, punctuation, grammar, sentence structure. Understanding of effects of language change upon writing and speaking. Suitable for upper grade, junior and senior high school teachers. 3 lectures. Prerequisite: ENGL 301 or consent of instructor.

ENGL 504 Problems in Language (3)

Study of development of English; consideration of problems of grammar and uses of language. May be repeated to 9 units. 3 lectures. Prerequisite: ENGL 503.

ENGL 505 Problems in Composition (3)

Study of 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 9 units. 3 lectures. Prerequisite: Graduate standing in English.

ENGL 511 Problems in American Literature (3)

Concentrated study of American authors or periods. Written and oral reports of individual investigation. May be repeated to 9 units. 3 lectures. Prerequisite: Graduate standing in English.

ENGL 512 Problems in British Literature (3)

Concentrated study of British authors or periods. Written and oral reports of individual investigation. May be repeated to 9 units. 3 lectures. Prerequisite: Graduate standing in English.

ENGL 522 Introduction to Teaching English as a Second Language (3)

Contrastive analysis of native and target language, methods and materials for testing and teaching English to non-native speakers: phonemic analysis, oral-aural drill, pattern practice, structure and grammar, composition, planning of curriculum materials from available resources. 3 lectures.

ENGL 590 Graduate Seminar in English (1-3)

Independent or group study of special problems in selected areas of language, composition, or literature. May be repeated to 9 units. 1-3 lectures. 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)

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 132, PHYS 131 or 121.

ENGR 301 Technology in the 20th Century (3)

The role of science, engineering and technology in the twentieth century. Effects of technological change, the function of the scientist-engineer in society. The 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. 1 lecture, 1 laboratory. Prerequisite: CHEM 122 or 125 or consent of instructor.

ENGR 311, 312 Mechanical and Electrical Systems (3) (3)

Introduction to design and installation of heating, air conditioning, plumbing, fire protection and electrical systems. Emphasis on structural and architectural implications of system types, lighting and power requirements, code constraints, and first and operating costs. 3 lectures.

ENGR 410 Engineer Examination Review (2)

Review of engineering fundamentals including mathematics, statics, dynamics, strength of materials, fluid mechanics, electricity, thermodynamics, heat transfer, chemistry, and economics, in preparation for Engineer-in-Training and Professional Engineer examinations. Not acceptable for graduate credit. 2 lectures. Prerequisite: Senior standing in Engineering, Architecture, or Agricultural Engineering.

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.

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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 226 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 101 Environmental Engineering Systems (2)

Analysis and design of elementary systems related to environmental control. Topics in thermal environmental control, air and water pollution control, and solid waste management. 1 lecture, 1 laboratory.

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 202, 203 The Thermal Environment (3) (2)

Analysis of heating and ventilating processes and equipment; application to industrial, commercial and public buildings. 3 lectures (202), 2 lectures (203). Prerequisite: CHEM 121 or 124 and PHYS 122 or 132.

ENVE 221 Solar Energy (3)

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, 122, 123 or equivalent.

ENVE 231 Fluid Systems (2)

Materials, equipment, principles, and techniques used in designing and installing environmental fluid flow systems. Uniform Plumbing Code. Field trips to relevant installations. 1 lecture, 1 laboratory. Prerequisite or concurrent: PHYS 122 or 132, CHEM 121 or 124.

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 251 Environmental Engineering Measurements (2)

Experimental studies of the instrumentation and basic measurements of concern to the environmental engineer. Procedures used in the analysis and reporting of experimental data. Corollary concepts of basic physical phenomena. 1 lecture, 1 laboratory. Prerequisite: ENVE 202.

ENVE 301 Introduction to Heat Transfer (3)

Principles of conduction, convection, and radiation heat transfer. Steady-state conduction, forced and natural convection, radiation, boilers, and heat exchangers. 3 lectures. Prerequisite: MATH 133, PHYS 123, ETME 301.

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 305 Thermodynamics of Refrigeration (4)

Thermodynamic analysis of refrigeration cycles. Thermodynamic analysis of various vapor compression refrigeration systems and components. 4 lectures. Prerequisite: ME 302, CHEM 125.

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 310 Weather and Climate (3)

Weather and climate as a part of the environment. Impact of these factors on industry, commerce and agriculture. Public services. Observation instruments and techniques. Not open to students who have credit for ENVE 428. 3 lectures. Prerequisite: CHEM 106, MATH 103, PHYS 104 and junior standing.

ENVE 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.

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, ENVE 313.

ENVE 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: ENVE 221, 313, ME 302 or CHEM 305. Concurrent: ME 341.

ENVE 324 Introduction to Air Pollution (3)

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 conduct 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)

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of the pollution of the environment. Disposal of wastes. Administrative and legal aspects. 3 lectures. Prerequisite: Junior standing.

ENVE 352 Thermal and Fluids Laboratory (3)

Laboratory tests in controls, thermodynamics, fluid flow, heat transfer, noise, and vibration. Analog methods. Performance testing of refrigeration systems, evaporators, condensers, fans, air washers, and air distribution devices. 1 lecture, 2 laboratories. Prerequisite: ENVE 251, ME 302.

ENVE 354 Thermal and Solar Laboratory (3)

Laboratory tests of thermodynamic processes, heat transfer equipment, refrigeration, analog methods. Solar energy instrumentation, collectors, systems. 1 lecture, 2 laboratories. Prerequisite: ENVE 251, 313, 322, ME 302.

ENVE 361 System Design (3)

Project work in designing environmental control systems. Heating, ventilating, air conditioning and air cleaning. Energy conservation analysis of systems and utilization of solar energy. 3 laboratories. Prerequisite: ENVE 202, 322, ME 302.

ENVE 365 Environmental Management & 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: Junior standing.

ENVE 366 Solar Energy Systems Analysis (5)

Performance analysis of active and passive systems utilizing solar energy for building and industrial process heating and cooling. Air and liquid systems, sensible and chemical storage, transient analysis, use of computer, absorption and natural cooling, economics, load calculations, controls. 5 lectures. Prerequisite: ENVE 322.

ENVE 367 Solar Energy Systems Design (3)

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, 2 laboratories. Prerequisite: ENVE 366.

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 403 Advanced Mass and Energy Transfer (3)

Psychrometric properties, processes and measurements. Wetted surface heat and mass transfer. Solar and convective periodic loads. 3 lectures. Prerequisite: ENVE 313, ME 302, 341.

ENVE 406 Advanced Fluid Flow (3)

Fluid dynamics and fluid machinery. Centrifugal and axial fans, pumps and compressors. Turbines. Fluid flow in ducts. 3 lectures. Prerequisite: ME 341, ENVE 251.

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 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, 226.

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 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: ENVE 202, 313, ME 341.

ENVE 443 Advanced System Design (3)

Individual and team project work in designing air conditioning and refrigeration systems. 1 lecture, 2 laboratories. Prerequisite: ENVE 441.

ENVE 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.

ENVE 463 Undergraduate Seminar (2)

Special studies and technical developments in the field. Individual reports on important research in the environmental engineering field. 2 lectures.

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 532 Industrial Ventilation and Exhaust Systems (3)

Environmental contamination, dispersion mechanisms, industrial comfort criteria; control of temperature, humidity, cleanliness and motion of air. Natural and forced ventilation, control velocities, air-handling systems and components. 3 lectures. Prerequisite: Graduate standing and consent of instructor.

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ENVE 533 Aerosol Technology (3)

Definition, theory and measurement of particle properties, particle statistics, size distribution, particle transport, gas cleaning, sampling of airborne contaminants. 3 lectures. Prerequisite: Graduate standing and consent of instructor.

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 lectures. 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 lectures. Prerequisite: Graduate standing and 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) (2)

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. Minimum 120 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 meetings. Prerequisite: SP 200 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 system. Energy analysis, air distribution, hydronic and solar systems. 1 lecture, 1 laboratory. Prerequisite: ETAC 122.

ETAC 201 Air Conditioning and Refrigeration Codes (2)

Introduction to current federal, state, and local codes for equipment and human safety as applied to building plumbing, heating, ventilating, refrigeration, and air conditioning systems. 2 lectures.

ETAC 214 Plumbing and Building Sanitation (4)

Application of materials and equipment in the design of piping for plumbing and drainage, special wastes, water supplies, fuel services, and fire protection in buildings and engineering structures. Selection of piping, connections, and plumbing fixtures as specified by current national and local codes. Specification writing for complete building sanitation systems. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

ETAC 221 Mechanical Equipment of Buildings (3)

Application of engineering analysis comfort control. The design of a building's conventional systems includes forced air circulation systems, sanitary plumbing, water supply and energy sources. Applicable building code requirements which influence system design are covered. 2 lectures, 1 laboratory. Prerequisite: PHYS 123.

ETAC 301 Programmable Calculator for 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, MATH 133, ENVE 301, 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.

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.

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 DC Circuits (4)**

Fundamental concepts and laws of DC electrical circuits. Applications of DC instrumentation. 3 lectures, 1 laboratory. Corequisite: MATH 120.

ETEL 125 Introduction to AC Circuits (4)

Fundamental concepts and laws of AC electrical circuits. Application of AC instrumentation and oscilloscope. 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 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 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: MATH 120, ETEL 125 and 234.

ETEL 233 Electronic Circuits and Devices II (4)

Study of active discrete and integrated devices. Use of device parameters and specifications to analyze simple linear circuits. Study and 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, 234, 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, 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 is made. A study of noise, its use and effects in communications, and a study of various forms of solid state RF amplifiers is also included. 3 lectures, 1 laboratory. Prerequisite: ETEL 311, 312.

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)

Introduction to machine and assembly language programming of a specific digital computer. Analysis of computer circuits and components in a computer system. Use of hardware and software aids for troubleshooting and development. 3 lectures, 1 laboratory. Prerequisite: ETEL 334 and ENGR 251.

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. Prerequisite: ETEL 312, 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.

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 ENGINEERING

ETME 131 Introduction to Engineering Drawing (2)

Basic instruction in drafting techniques and equipment. Geometric constructions for drafting. Basic principles and practices of isometric, oblique, and multiview drawing systems, including section reviews. 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 Systems (2)

Advanced multiview and pictorial drawing. Detail and assembly drawings. Conventional industrial drafting practices including section views. Techniques of dimensioning. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

ETME 156 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.

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.

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 and MATH 132.

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: MATH 133, PHYS 122, CHEM 121.

ETME 311 Fluid Mechanics (3)

Study of the 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 320 Mechanisms (4)

Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 2 lectures, 2 activities. Prerequisite: PHYS 121, ETME 142, ENGR 251.

ETME 333 Industrial Hydraulics and Pneumatics (4)

Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulics 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 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 (3)

Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes gas, gasoline, diesel and steam engines; gas and steam turbines, boilers and some of the newer developments being applied to industry. Fuel conservation and pollution control. 2 lectures, 1 laboratory. Prerequisite: ETME 301, 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 142.

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, 320, CE 202, 203.

ETME 437 Applied Fluid Power Systems (4)

Application aspects 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, 344, 421, ENGR 251.

ETME 443 Mechanical Systems (5)

Application of technical principles incorporating various components into an integrated system. Project design oriented activities to provide an industrial like condition so that the student may become familiar with component selection and layout of mechanical systems, emphasizing industrial handbook and catalog material. 2 lectures, 3 laboratories. Prerequisite: ETME 333, 422, MET 235.

ETMP—ENGINEERING TECHNOLOGY—MANUFACTURING PROCESSES

ETMP 121 Manufacturing Survey (1)

An 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 127 Manufacturing Processes Fundamentals (2)

Survey of materials and manufacturing processes. Possibilities and limitations of these processes. Application to fabrication of industrial products. Limited experience in conventional machine tool operation and use of semiprecision measuring tools. For nonengineering majors. 1 lecture, 1 laboratory.

ETMP 144 Manufacturing Processes: Turning-Milling (2)

Uses, capabilities, theoretical and operational characteristics of lathe and milling type 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.

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ETMP 145 Manufacturing Processes (2)

Relationship between engineering design and production fabrication. Hole forming by drilling, broaching, punching, piercing and nontraditional methods including numerical control. Forming and assembling of gage metal components. Machine tool classifications; use of hand tools; basic layout procedures; engineering and economic significance of various production techniques. 1 lecture, 1 laboratory.

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 (1-2)

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 or 2 laboratories. Prerequisite: Consent of instructor.

ETMP 244 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 245 Advanced Machining Operations (2)

Advanced problems of conventional, automatic and numerical control lathe and milling type machine tools. Application of machine accessories, fixtures and attachments. American Standard Association Charts, data and material classification. Instrumentation for quality control. Metal cutting band, saw gear shaper, and hobber. 1 lecture, 1 laboratory. Prerequisite: ETMP 224.

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. Prerequisite: 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, accuracy, and repeatability. Role of grinding fluids. Grinding capability and comparison to other processes. 1 lecture, 1 laboratory. Prerequisite: ETMP 224, 245.

ETMP 336 Numerical Control Machine Tool Programming (3)

In-depth study of 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. Prerequisites: ETMP 144; MFGE 233.

ETMP 421 Industrial Numerical Control (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.

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 235 Nondestructive Examination (4)

Theory and application of nondestructive test systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, eddy current and holography. For Engineering Technology, Welding, and Manufacturing Processes majors. 2 lectures, 2 laboratories. Prerequisite: ETWT 259, PHYS 123.

ETWT 240 Additional Welding Laboratory (1-2)

Individual welding 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 or 2 laboratories. Prerequisite: ETWT 144 or consent of instructor.

ETWT 259 Advanced Welding (1)

Theory and application of various gas shielded arc welding processes to the welding of aluminum, carbon steel, and stainless steel. 1 laboratory. Prerequisite: ETWT 144.

ETWT 324 Welding Technology (4)

Structure of metals, types of steel and their manufacture. Welding processes, 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, ETMP 144.

344 ETWT—FDSC

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 235, 259, 325.

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, MATH 120, ETEL 126.

ETWT 434 Advanced Welding Technology (3)

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. 1 lecture, 2 laboratories. Prerequisite: CE 202, 203; ETWT 235, 326; PHYS 123.

ETWT 435 Advanced Welding Technology (3)

Weldability studies on stainless steels and copper base alloys. Design of complex weldments. Introduction to corrosion. Cost estimating. Emphasis is on semiautomatic and automatic welding processes. 1 lecture, 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)

Study of food processing equipment, mechanical principles, equipment maintenance, and basic control devices used in food processing and the 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. 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)

The 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 Classification and Grading (2)

A comprehensive and detailed study of those factors related to carcass quality, conformation, and yield. Judging of carcass and wholesale cuts. Field trip to meat packing plants is required. 1 lecture, 1 laboratory. Prerequisite: FDSC 210.

FDSC 230 Elements of Food Processing (4)

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 required. 3 lectures, 1 laboratory. Prerequisite: FDSC 122, 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 required. 2 lectures, 1 laboratory. Prerequisite: FDSC 122, 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 required. 2 lectures, 1 laboratory. Prerequisite: FDSC 122, 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)

The 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)

The application of statistical methods in quality control programs and evaluation of operations. Calculator required. Field trip required. 3 lectures. Prerequisite: 12 units of 100-200 level FDSC courses or consent of instructor.

FDSC 336 Packaging (3)

Study of packaging materials, packages and packaging methods applicable to a variety of processed foods. Field trip required. 3 lectures. Prerequisite: 12 units of 100-200 level FDSC courses or consent of instructor.

FDSC 338 Sausage and Smoked Meats (3)

The manufacturing of processed meats. Product formulation, curing, smoke house operation. Field trips required. 2 lectures, 1 laboratory. Prerequisite: FDSC 210 or 209.

FDSC 341 Wines and Fermented Foods (3)

Methods of production and testing of beer, wines and fermented foods. Field trips 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, 150, 241, 243, and 245.

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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 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 required. 2 lectures, 1 laboratory. Prerequisite: FDSC 241, 243, 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.

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 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 120 hours total time.

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 lectures. 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 lectures. Prerequisite: Graduate standing and consent of instructor.

FORL—FOREIGN LANGUAGE

FORL 101, 102, 103 Foreign Language (3) (3) (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.

FPM—FINANCE AND PROPERTY MANAGEMENT

FPM 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.

FPM 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 207. Junior standing required.

FPM 331 Real Estate Practice (4)

Practical aspects of the real estate business: licensing, office management, selling, contracts and leases, advertising and public relations, financing, escrow, taxation, insurance, business opportunities, property management, exchanging, syndication and investment. 4 lectures. Prerequisite: FPM 330.

FPM 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: FPM 330.

FPM 333 Real Estate Appraisal (4)

Cost, market, and income approaches to valuation. Appraisal process for urban residential and investment properties. 4 lectures. Prerequisite: FPM 330.

FPM 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: FPM 330, FPM 332 and/or 333 recommended.

FPM 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. Junior standing required.

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FPM 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, FPM 342, STAT 252.

FPM 412 Law of Real Property (4)

Legal problems of acquisition, ownership and transfer of real property. Leases, liens, taxes, homestead, environmental law, easements and zoning. 4 lectures. Prerequisite: BUS 201 or 207.

FPM 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, FPM 342.

FPM 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: FPM 342.

FPM 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: FPM 342, ECON 337.

FPM 480 Advanced Seminar in Investment (4)

A seminar covering current topics in investments. An in-depth analysis of the efficient markets hypothesis and capital market theory. 4 seminars. Prerequisites: FPM 411.

FR—FRENCH

FR 101, 102, 103 Elementary French (5) (5) (5)

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 5 lectures.

FR 123 French Phonetics (2)

Course is designed to help the student acquire correct French pronunciation by eliminating English sounds. 2 lectures. Prerequisite: FR 103 or equivalent.

FR 201, 202, 203 Intermediate French (3) (3) (3)

Review of French grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. 3 lectures. Prerequisite: FR 103 or consent of instructor. Simultaneous enrollment in FR 221, 222, 223 is recommended.

FR 221, 222, 223 French Conversation (2) (2) (2)

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement intensive oral classroom practice. 2 lectures. Prerequisite: FR 103 or consent of instructor. Simultaneous enrollment in FR 201, 202, 203 is 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 Readings in French Literature (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)

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 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 Beekeeping (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. 3 lectures, 1 laboratory. Credit will not be allowed for both FRSC 131 and 230.

FRSC 132 Pomology (4)

Mineral nutrition, orchard planning, and pruning of deciduous fruit trees. Apricot, cherry, peach, plum, prune, and olive culture. 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)

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 230.

FRSC 231 Viticulture (4)

A comprehensive study of 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 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.

350 FRSC—GEOG

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 are also included. Orchard practice. A field trip to a major California production area is required. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

FRSC 421 Advanced Pomology (3)

Storage problems, post-harvest physiology, environmental factors affecting fruit development. Maturity standards. Two-day field trip required. 2 lectures, 1 laboratory. Prerequisite: FRSC 133.

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 lectures, 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 lectures.

GEOG—GEOGRAPHY

GEOG 150 Human Geography (3)

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 Man's Impact on the Earth (3)

Short history of major attitudes toward nature; problems stemming from the interactions of population growth, technology, and natural resources; transformation of natural landscapes into cultural landscapes. 3 lectures.

GEOG 250 Physical Geography (3)

Distribution and interrelationships of the earth's physical phenomena. Landforms, weather and climate, 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)

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)

Man's utilization of the natural environment. Spatial aspects of production, distribution, and consumption of commodities from the earth. 3 lectures. Prerequisite: Junior standing.

GEOG 320 Geography of Hunger (3)

A 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 340 Geography of California (3)

The 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. Topically and regionally organized. 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)**

Processes responsible for the earth's present characteristics. Mountain building, metamorphism, igneous activity, depositional agencies, sedimentation. Examples from local area. Topographical and geological maps. Rocks and minerals. 3 lectures.

GEOL 203 Introductory Paleontology (3)

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)

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)

Plate tectonics, seismicity and faulting. Quake mechanisms, intensity and magnitude. Measurement and prediction. History. Prevention and planning. Related geological effects. 3 lectures.

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GEOL 206 Geologic Excursions (1) (CR/NC)

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. Offered on a Credit/No Credit basis. 1 laboratory. Recommended prerequisite: GEOL 201, 202, or 204.

GEOL 211 Cities and Geology (3)

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)

Properties, identification, and origin of earth materials. Interpretation of topographic maps, aerial photos, geologic maps, scale models, and field observations in terms of the effect of geologic processes on the earth's surface, internal structure, and man's use of the earth. 1 laboratory. Prerequisite or concurrent: GEOL 201.

GEOL 302 Geological Resources (3)

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)

For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. To be taken in numerical sequence. 5 lectures.

GER 201, 202, 203 Intermediate German (3) (3) (3)

Review of German grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. 3 lectures. Prerequisite: GER 103 or consent of instructor. Simultaneous enrollment in GER 221, 222, 223 is 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, 202, 203 is 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 is used with concentration on the further development of a specialized vocabulary. 3 lectures, 1 activity.

GER 305 Significant Writers in German (4)

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)

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. 1 lecture, 2 laboratories.

GRC 132 Letterpress (2)

Handfed and automatic platen press operation. Makeready, lockup, imposition, scoring and perforating, roller care, basic study of platen press ink and paper relationship. 1 lecture, 1 laboratory.

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 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 Composing Machines (2)

Introduction to composition systems. Newspaper, bookwork, magazine, and commercial composition. 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 Offset Lithographic Presswork (5)

Theory and practice in the use of sheet-fed offset presses for both single color and multicolor printing. Investigation of feeding, printing and delivery systems. Dampening and inking systems. Process color printing. Press quality control. 3 lectures, 2 laboratories. Prerequisite: GRC 228 or consent of instructor.

GRC 233 Relief Printing Specialties (3)

Automatic and cylinder presswork. Halftones, process color printing. Die cutting, creasing, foil stamping, blind embossing and varnishing. 1 lecture, 2 laboratories. Prerequisite: GRC 132.

GRC 301 Composition Systems (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 (3)

Estimating various kinds of printing produced by the major processes. Use of standard price catalogs. Analysis of material, labor, and machine cost factors. 3 lectures. Prerequisite: GRC 111 or junior standing.

GRC 304 Theory of Color (2)

Light and color theory. Understanding of the physical, chemical, and psychological concepts of color. Color systems. Application of color theory to full-color printing. 2 lectures.

GRC 312 Theory of Lithography (3)

Theories of the lithographic process in relation to chemical and physical factors. Film emulsion and bases, darkroom chemistry and processing, lithographic plate bases, coatings and processing, pH of solutions, lithographic press chemistry, blankets and schematics. 3 lectures.

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 Substrates (3)

Application of substrates and material design 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 (5)

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, 3 laboratories. Prerequisite: GRC 323 or consent of instructor.

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. 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 (4)

Sales management, salesmanship, sales forecasting techniques, and marketing of printed products. Purchasing. 4 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 (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 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. Instruments for quality control in the printing industry. 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.

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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 (5)

Complex and experimental art media and their limitations for use in line and halftone reproductions by the major printing processes. 2 lectures, 3 laboratories. Prerequisite: GRC 335.

GRC 459 Graphic Communication Developments (2)

Developments and trends in processes, methods, materials and equipment used in graphic communication. 2 activities. Prerequisite Senior standing or consent of instructor.

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 120 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 Accounting for Management Planning and Control (4)

Accounting issues applied to management planning control and information systems in industry, government and nonprofit organizations. Problem analysis in budgetary control, standard and direct costing, decentralized profit control, inter-division transfers and long-range planning. 4 lectures. Prerequisite: Classified graduate standing.

GSB 512 Accounting Theory and Policy (4)

Selected issues in the development and application of accounting theory and policies within the economic, political, and social framework. External influences on financial reporting. Translation of theory into practice. 4 lectures. Prerequisite: GSB 511.

GSB 521 Marketing Management (4)

Detailed analysis of marketing management: Policy planning strategy formulation; organization; directing; coordinating marketing activities. 4 lectures. Prerequisite: Classified graduate standing.

GSB 522 Marketing Management Seminar (4)

Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 meetings. Prerequisite: GSB 521.

GSB 531 Business Finance (4)

Analysis of acquisition and administration of assets and liabilities by corporations. Theory and practices underlying financial decision-making. Problems in financial management: interface with production and marketing; capital budgeting; optimal capital structure; working capital management; asset valuation; and dividend policy. 4 lectures. Prerequisite: Classified graduate standing.

GSB 532 Money and Capital Markets (4)

Money and capital markets and financial intermediaries. Factors that affect supply, demand, prices, and interest rates in these markets. 4 lectures. Prerequisite: GSB 531.

GSB 533 Seminar in Investments (4)

Stock, bond and options market. Emphasis on operations of markets, the efficient markets hypothesis, and portfolio theory. 4 meetings. Prerequisite: GSB 531.

GSB 541 Microeconomics (4)

Analysis of demand, production, cost functions, behavior of competitive markets, market imperfections and distribution of income. 4 lectures. Prerequisite: Classified graduate standing.

GSB 542 Seminar in Economic Forecasting (4)

Short- and long-term forecasts of business activity through the construction of econometric or time series models. Analysis of models in forecasting exercises. 4 meetings. Prerequisite: GSB 541.

GSB 551 Quantitative Methods in Decision Making (4)

The concepts and techniques of quantitative methods relating to management decision-making process. Review of basic quantitative and statistical concepts. Development of quantitative techniques utilized in the business organization today for decision-making and planning purposes and investigation of the methodology for the future. 4 lectures. Prerequisite: Classified graduate standing.

GSB 552 Operations Management and Information Systems (4)

The development of the production function and its interaction with other functional areas in the organization. Application of quantitative and statistical methods to the management planning and decision-making function in operations management. The Management Information System and its relation to the decision-making process. Extension of the methods of problem solving to functional areas other than the formal production process and to industry with no production components. 4 lectures. Prerequisite: Classified graduate standing and GSB 551.

GSB 561 Organizational Behavior (4)

Examination of major psychological theories and conceptual constructs relating to behavior in modern organizations. Leadership styles, group dynamics, motivation, communication, perception, conflict resolution, and attitude change are related to the behavioral implications affecting organizational effectiveness and performance. 4 lectures. Prerequisite: Classified graduate standing.

GSB 562 Seminar in Labor Relations and Collective Bargaining (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 meetings. Prerequisite: Classified graduate standing.

GSB 563 Seminar in Organizational Change and Development (4)

Methods of achieving organizational effectiveness developed by organizational science practitioners. Personal growth and goal setting, team development, intergroup conflicts, surveyed as areas needing integration through action programs designed for production and people effectiveness. 4 meetings. Prerequisite: GSB 581.

GSB 571 Business and Society (4)

The business organization as a social, economic, and legal institution with social-ethical responsibilities. Analysis of the business organization's interrelationships with competitors, government, pressure organizations, consumers, and employees in the social, political, and legal environment. 4 lectures. Prerequisite: Classified graduate standing.

GSB 572 International Business and Operations (4)

Buying, selling, and producing abroad. International distribution channels. Foreign domestic organizations. Foreign subsidiaries and divisions. Multinational money markets. Import taxes, governmental subsidies and differential freight rates. U.S. tax treatment of operations and U.S. citizens abroad. 4 lectures. Prerequisite: Classified graduate standing.

GSB 581 Management and Organizational Theory (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 functions and processes. Current issues and actual cases. 4 lectures. Prerequisite: Classified graduate standing.

GSB 582 Organizational Analysis, Planning and Decision Making (4)

Organizational analysis strategies and constructs; environmental, technological, and behavioral imperatives influencing organizational objectives, structures, and design. Strategic and tactical planning concepts and criteria relating to industrial, governmental and nonprofit organizations. Problem definition and decision-making, including diagnostic analysis, causation analysis, alternative formulation, and optimization criteria and techniques. 4 lectures. Prerequisite: GSB 581.

GSB 583 Business Policy Strategy (4)

Case study of policy formulation, objective definition, strategy, control and integration of total organization imperatives. Emphasis on analysis of problems faced by chief executive officers in policy implementation, coordination, and appraisal of organization performance. Policy issues relating to environmental aspects, growth strategies, technological diversification, and alternative strategies. 4 lectures. Prerequisite: All required CBOK and Advanced Study Courses taken prior to spring quarter.

HE—HOME ECONOMICS**HE 101 Orientation to Home Economics (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 106 Introduction to Clothing Construction (2)

Basic studies in clothing construction, course designed for those with limited or no previous experience. Emphasis on selection and use of construction techniques for woven fabrics. Not open to students who have completed HE 131. 1 lecture, 1 three-hour laboratory.

HE 121 Fundamentals of Food (4)

Theoretical aspects and practical applications of the principles of food science and food preparation. 3 lectures, 1 three-hour laboratory. Prerequisite: CHEM 121.

HE 122 Design Analysis for Home Economists (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)

Intermediate techniques in clothing construction. Emphasis on fabrics, fit and quality construction. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 106 or consent of instructor.

HE 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.

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)

Effects of various housing environments on the dynamics of family life. Emphasis on consumer housing problems. 3 lectures. Prerequisite: SOC 105.

HE 210 Nutrition (3)

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 observations and laboratory experiences. 1 lecture, 1 three-hour laboratory. Prerequisite: HE 122 or consent of instructor.

HE 225 Textile Development and Dyeing (2)

The development of textiles by the use of various fibers; dyeing processes, and construction through observation and laboratory experience. 1 lecture, 1 three-hour laboratory. Prerequisite: HE 122 or consent of instructor.

HE 226 Home Food Conservation (2)

Conservation techniques to obtain maximum control of food quality with most efficient use of time, energy, and economic resources. 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 production, distribution, 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. One 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 131 or consent of instructor.

HE 242 Interior Design (4)

Basic interior design dealing with the visual, functional, and consumer aspects of manipulating interior space. Individual creative laboratory experience in solving realistic design problems. 3 lectures, 1 two-hour laboratory. Prerequisite: HE 122 or consent of instructor.

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HE 309 History of Interior Design (3)

Development of furniture styles and their environments from ancient times to the present. 3 lectures. Prerequisite: Junior standing.

HE 310 Maternal and Child Nutrition (3)

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: HE 210

HE 315 Textile and Clothing Industries (3)

Commercial aspects of design, production, promotion and distribution of textiles and clothing. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HE 321 Food Management (3)

Current trends and developments in food management. Food marketing systems, consumption patterns and legislation related to food. Planning, preparing and serving of meals for diverse situations reflecting current meal trends. Emphasis on nutritional, aesthetic, and economic aspects. 1 lecture, 2 two-hour laboratories. Prerequisites: HE 121, 122, 210.

HE 322 Textiles (3)

Physical and chemical characteristics of natural and synthetic fibers. Yarns, fabrics, and textile finishes. Application of theory to textile fabrics. Selection, use, and care. 2 lectures, 1 three-hour laboratory. Prerequisite: CHEM 122 or consent of instructor.

HE 323 Individual Residential Design (3)

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, 1 two-hour laboratory. Prerequisite: HE 207, 344 or consent of instructor.

HE 324 Management of Family Resources (3)

Application of management principles as they relate to contemporary aspects of family and group living situations. Analysis of selected purchase decisions. 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: SP 201, HE 331 or consent of instructor.

HE 328 Advanced Nutrition (4)

Nutrient requirements of man; 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: HE 210, CHEM 328, ZOO 131.

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)

French draping fundamentals as one element of the apparel design production process. Designing for the individual and the fabric. 1 lecture, 2 three-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. 3 lectures. Prerequisite: 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. 2 lectures, 1 two-hour laboratory. Prerequisite: HE 220, 242, or consent of instructor.

HE 348 Experimental Nutrition (2)

Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 three-hour laboratories. Prerequisite: HE 328 or consent of instructor.

HE 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.

HE 401 Occupational Training Seminar (3)

Current developments in the teaching of home economics-related occupations at the secondary level. May be repeated up to 6 units. 3 lectures. Prerequisite: Senior standing or consent of instructor.

HE 404 Financial Responsibilities of the Family (3)

Understanding the economic role of the family: factors affecting use of income; cost of goods and services within the U.S. economic system. Opportunity to analyze a family's financial situation and understand how its specific socio-economic level relates to other families. 3 lectures. Prerequisite: HE 324 or consent of instructor.

HE 407 Family Housing Trends (3)

Study of housing industry trends in construction and mass marketing as they affect the practice of professional residential interior design. 3 lectures. Prerequisite: HE 207, ECON 201, or consent of instructor.

HE 411 Curriculum and Methods for Homemaking Education (4)

Development of a timely philosophy in consumer and homemaking education. Classroom management, procedures, curriculum development, teaching aids and evaluating techniques for teaching homemaking in junior and senior high schools, including federally reimbursed programs. Field trips required. 4 lectures. Prerequisite: 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 lectures.

HE 415 Methods of Teaching Nutrition (3)

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: HE 328 and ED 335, and senior standing.

HE 416 Community Nutrition (3)

Problems inherent in improvement of nutrition at the community level. Relation to local, state, and national nutrition programs. Role of the nutritionist in public health, social welfare, agricultural extension, and school lunch program. 2 lectures, 1 two-hour activity. Prerequisite: HE 415.

HE 421 Cultural and Aesthetic Aspects of Food (3)

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. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 321 or consent of instructor.

HE 422 Advanced Textiles (3)

Advanced study of fiber structure and fabric finishes as related to textile performance. Laboratory testing of fibers and fabrics. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 322.

HE 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: HE 321, senior standing or consent of instructor.

HE 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: HE 321, senior standing or consent of instructor.

HE 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.

HE 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: HE 348.

HE 432 Advanced Interior Design (3)

Individual creative experiences in problems of interior design. Total credit limited to 6 units. 3 two-hour laboratories. Prerequisite: IT 245, HE 309, 323 or consent of instructor.

HE 433 Historic Costume (3)

Chronological study of garment designs as related to dominant cultural influences. 3 lectures.

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 (2) (2)

Selection and completion of a career-related project under faculty supervision. The project is a formal report which must follow department established form and style guidelines requiring a minimum of 120 hours of independent student work. Prerequisite: ENGL 114, ENGL 218 or 300. 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 lectures. 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. 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 the department head, the graduate program coordinator, and the supervising faculty member.

HE 501 Seminar in Family Management (3)

Principles, major problems and trends affecting the economic decisions of the family. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

HE 511 Research Design (3)

Methods of research and critical analysis of scientific literature and problems in home economics. 3 lectures. Prerequisite: Graduate standing.

HE 525 Experimental Studies in Textiles (2)

Review and reporting of current developments in textiles; study and analysis of pertinent literature. Application through laboratory testing. 1 lecture, 1 two-hour laboratory. Total credit limited to 4 units. 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 lecture, 1 two-hour laboratory. Total credit limited to 4 units. Prerequisite: Graduate standing or consent of instructor.

HE 532 Problems and Trends in Interior Design (3)

Current developments in design, materials, and coordination of home furnishings. Individual problems. 3 lectures. 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 lectures, 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 lectures. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

HE 582 Seminar in Nutrition (1)

Critical review of literature on selected topics in the field of nutrition. Total credit limited to 3 units. Prerequisite: Graduate standing or consent of instructor.

HE 584 Seminar in Women's Roles (3)

Redefinition of sex roles. Methods of solving family role conflicts as women enter the labor force and the political arena. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

HE 585 Seminar in Clothing (3)

Current trends in clothing design and construction. Advanced study of clothing related to human behavior. 3 lectures. Prerequisite: HE 341 and graduate standing or consent of instructor.

364 HE—HIST

HE 587 Seminar in Family Housing (3)

Current housing problems of minorities, the elderly, handicapped, and other groups of concern to professional home economists. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

HE 599 Thesis (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 112 History of California (3)

The development of California; government, economy, culture. 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)

A comprehensive survey of the development of the United States from the 15th century to the present. Hist 203 satisfies the general education requirement of HIST 204 for Social Science, Political Science, and History majors. 3 lectures.

HIST 204 Growth of American Democracy (3)

The 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)

The 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 211 Issues in United States History (3)

Analysis of selected issues in United States civilization from the seventeenth to the twentieth century. Multiple causation as a means of explaining historical change. 3 lectures.

HIST 221 Historical Craft (3)

An introduction to research and writing methods in history; a seminar approach to the craft of history. Topics: The nature of historical research, research methods, library facilities, basic bibliography and organization skills, writing techniques. 3 lectures.

HIST 270 History through Film (3)

Various historical themes are examined through the medium of film. The influence and overall relationship of films to the societies that produced them are examined. May be repeated to 6 units. 2 lectures, 1 laboratory.

HIST 301 Historiography (3)

Theory, interpretation and philosophies of history. 3 seminar meetings. 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. 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 311, 312, 313 British History (3) (3) (3)

History of the English people from the Roman era to the present. Development of law, language, religion, literature, and the struggles for parliamentary government and economic opportunities. 3 lectures. Prerequisite: Junior standing or consent of instructor.

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 318 History of Modern Ireland (3)

A study of Ireland since 1845. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 321 Early Chicano History (3)

Political, economic and social history of Mexican-Americans from the Colonial period to the late 19th century. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 322 Recent Chicano History (3)

Political, economic and social history of Mexican-Americans in the 20th century. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 325 Ethnic Groups in American History (3)

Role of ethnic, racial, and religious minorities; their contributions to the political, economic, and social development of American life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 328 American Indian History (3)

A historical examination of Native American culture; the topics of conflict and contributions will be emphasized. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 329 American Indian Thought (3)

A study of the 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 Early Afro-American History (3)

Political and social history of Afro-Americans from the early 17th century to the end of the Reconstruction. Contributions to American cultural and political life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 332 Recent Afro-American History (3)

Political and social history of Afro-Americans from the end of Reconstruction to the present as background of contemporary developments. 3 lectures. Prerequisite: Junior standing and HIST 331.

HIST 339 Latin American History, Colonial Period (3)

The mixture of the Spanish, Portuguese and Native American civilizations and the resulting political, economic and cultural situation. Conflicts leading to the independence movements and a description and analysis of those movements. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 340 Latin American History, National Period (3)

The patterns of Latin America after independence—national, regional, political, economic, cultural. Unity and diversity as it has developed to the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

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 The Classical Age (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 Counter-Reformation, Absolutism, and Religious War (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 349 The Age of Enlightenment and Revolution (3)

Ancien Regime, Enlightenment, Despotism, and Bourgeois Revolution in the West; political, economic, social, and cultural developments from the beginning of the eighteenth century through the Napoleonic era. 3 lectures. Prerequisite: Junior standing or consent of instructor.

HIST 351, 352, 353 Modern European History (3) (3) (3)

Growth of political institutions; development of national states; imperial rivalries; origins of World War I; peace settlements; totalitarianism; World War II; developments since 1945. 3 lectures. Prerequisite: Junior standing or consent of instructor.

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 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 The American West (3)

Development of the Trans-Mississippi West. 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 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.

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)

Social, political, and economic history during the latter part of the 19th century. 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 (2)

Selected history topics taught in grades 4-6 in California, including ethnic Americans, third world cultures and the interdisciplinary historical method. 2 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)

The 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)

The 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)

The 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)

The 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. Prerequisite: HIST 301.

HIST 465 Oral History (3)

Practical experience in all facets of oral history. Value and tools of oral history, preparation for the interview, interviewing, transcribing, editing the transcript, and preservation and use of the tape and transcript. 3 activities. Prerequisite: Junior standing or consent of instructor.

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 meetings. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

HUM—HUMANITIES**HUM 270 Contemporary Ideas (3)**

Interdisciplinary study of human values as they relate to one or more areas of these disciplines: history, literature, philosophy, and the arts. 3 lectures. May be repeated to a maximum of 6 units. Prerequisite: PHIL 101 or consent of instructor.

HUM 303 Studies in World Culture (3)

Concentrated study of the fine arts, culture, languages, and intellectual traditions of a specified culture. Subtitle to designate culture. 3 lectures in English.

HUM 320 Future Studies (3)

Evaluation of methods used in forecasting future trends. Critical examination of the predictions made by futurists and their implications for humankind. 3 lectures. Prerequisite: Junior or senior standing and ENGL 105.

HUM 340 Modes of Inquiry (3)

The process of forming ideas or images. Application of the findings to various disciplines and occupational fields. Assessment of the implications for the individual and society. 3 lectures. Prerequisite: Junior standing and PSY 202.

HUM 350 Aesthetics (3)

Interdisciplinary investigation of artistic phenomena and aesthetic experience which may emphasize psychology, philosophy, history, arts, or literature. 3 lectures. Prerequisite: PHIL 101.

HUM 400 Independent Travel Project (1-2)

Independent preparation of a travel study project related to the student's academic studies. Bibliography and plan for investigation submitted in advance. Project evaluated after travels. 1-2 activities. Prerequisite: Senior standing or consent of instructor.

HUM 402 Human Values (3)

Humanistic and social science learning concerning human values. 3 lectures. Prerequisite: Senior standing.

HUM 461 Senior Project (3)

Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 120 hours time.

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. Prerequisite: IE 101.

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 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 a finished product from encompassing product materials, processing and assembly, labor, depreciation, general and administrative overhead costs. Compilation into a final cost. Break-even analysis, learning curves and network-cost analysis are introduced. Volume vs. price and quality. 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. 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: IE 123, MATH 141.

IE 239 Industrial Costs and Controls (4)

The estimating of manufacturing costs based on forecasts for production planning, cost analysis, and cost control. Budgeting costs and analysis of cost variances as principal keys to cost control, inventory valuation, and pricing. Techniques of forecasting, cost estimating, and cost reduction. 3 lectures, 1 laboratory. Prerequisite: IE 123, MATH 141, 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.

IE 304 Operations Research (3)

Introductory study of matrix theory, linear programming (by graphical and Simplex method), sensitivity analysis, transportation algorithm, assignment algorithm, probability theory and queuing theory. Use of existing "canned" computer programming will be covered. 3 lectures. Prerequisite: STAT 321, MATH 242.

IE 305 Energy Conservation (3)

The critical nature and importance of energy conservation. Motivation toward and the use of the techniques of conservation in the home and consumption devices of everyday life. Calculations of energy costs to the individual. 3 lectures.

IE 312 Data Analysis (3)

Applying basic filing systems, tab card systems and computers to data collection and analysis. The planning, design, and use of auxiliary files for electronic data processing. Survey of pertinent computer languages. Establishment of data bases required for manufacturing and work control systems. 2 lectures, 1 laboratory. Prerequisite: ENGR 251, IE 251, 304.

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, and work environment to match human capacities and limitations. 3 lectures. Prerequisite: PSY 202 and junior standing.

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. Systems approach to optimum facilities design. 2 lectures, 2 laboratories. Prerequisite: IE 223, 251, ENGR 251, MATH 142 and junior standing in Engineering.

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 lectures. 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)

Introductory study of network analysis, dynamic programming, game theory and inventory theory. Computer programming in solution of problems. 3 lectures. Prerequisite: IE 304, STAT 321.

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, STAT 321, 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, 407.

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)

The study of planning and control systems required in manufacturing firms. The development of systems to assist in forecasting demand, scheduling orders, assigning workforce, controlling inventory and monitoring costs. Evaluate the control system performance using the computer-based manufacturing simulators PROSIM and GALS. 2 lectures, 1 laboratory. Prerequisite: MFGE 124 or IE 123, ENGR 251, IE 304, STAT 321, or consent of instructor.

IE 413 Group Technology (3)

Computer-automated process planning will allow students to examine through work for classification and coding, variety reduction, and component statistics. Equipment will be arranged in cells to create more ordered physical work flow by use of quantitative techniques. 3 lectures. Prerequisite: IE 405, 410.

IE 414 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: MATH 242, ENGR 251, ECON 211, IE 251, senior standing or consent of instructor.

IE 415 Engineering Economics (2)

Engineering economic analysis of engineering decisions. Selection and use of interest rate factors, methods of analysis, depreciation and taxes as applied to cases in the field of engineering. 2 lectures. Prerequisite: MATH 143, junior standing.

IE 420 Industrial Systems (3)

Application of general systems theory to industrial systems. Techniques of building simulation models that represent real industrial situations. Use of parametric runs to evaluate the sensitivity of system parameters. 2 lectures, 1 laboratory. Prerequisite: STAT 321, ENGR 251, IE 304, 312.

IE 421 Manufacturing Organization (3)

Theory and principles of manufacturing organizations. Planning and operations in terms of controlled resources. Other resources and factors within and external to the firm. Systems engineering employed to assure effective use of available resources. 3 lectures. Prerequisite: Senior standing, PSY 202.

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, 351.

IE 430 Statistical Quality Control (3)

Statistical theory of sampling to analyze output variation. Managerial methods to control attributes of incoming or in-process material. Quantitative risk factors for decisions based on sampling procedures with associated operating characteristics and control charts. Case studies and experiments. 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, 233.

IE 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 of total time. Prerequisite: MFGE 334, IE 343 and 414.

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 lectures. Prerequisite: Senior standing in IE 461.

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 lectures. Prerequisite: IE 304, CSC 219, STAT 322, 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 lectures. Prerequisite: IE 425, 430, STAT 322; 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 lectures, 1 laboratory. Prerequisite: IE 319 or equivalent and a course in biology.

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 Computation (2)**

A study of the techniques used in the analysis and solution of typical technical problems. Emphasis on the need for orderly work, checking procedures, handling and presenting scientific data; purpose and presentation of technical reports. 2 lectures.

IT 111 Industrial Arts Careers (1)

Survey of career opportunities in Industrial Arts and trade-technical teaching at the secondary school and community college levels. Job entry requirements. Technical and professional preparation. Credential requirements. 1 lecture.

IT 112 Industrial Technology Careers (1)

Survey of career opportunities in Industrial Technology. Job entry requirements and employment procedures. Technical and professional preparation. 1 lecture.

IT 125 Industrial Wood Processes (3)

Analysis of basic woodworking equipment, processes and materials currently used in lumbering, mill-cabinet, general construction and related industries. Theory and practice in the use of woodworking equipment. 2 lectures, 1 laboratory.

IT 130 Automotive Fundamentals (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. 1 lecture, 1 laboratory.

IT 135 Motorcycle Fundamentals (2)

Principles of operation and familiarity with basic components of the motorcycle from the consumer viewpoint. Economics of selection, safety, operation and preventive maintenance. Practical experience, owner maintenance and repair for beginners. 1 lecture, 1 activity.

IT 141 Plastics Processes and Applications (1)

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. 1 laboratory.

IT 222 Power Technology: Sources (3)

Analysis of power sources: natural, steam, internal combustion, continuous combustion, nuclear energy, fuel cells, photo cells, thermal electricity. Transmission of power; clutches, gear trains, wrapped connectors, hydraulics, pneumatics, universal joints, bearings, lubricants. 2 lectures, 1 activity.

IT 229 Industrial Materials (3)

An investigation of the characteristics, applications and limitations of materials of industry including: plastics, glass, ceramics, rubber, abrasives and adhesives, wood, fuels and lubricants. 2 lectures, 1 activity. Prerequisite: Sophomore standing.

IT 233 Metal Technology (3)

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. 1 lecture, 2 activities.

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 Automotive Power (4)

Theory and operation of automotive and other transportation power sources: Four cycle, two cycle, rotary, diesel and turbine internal combustion engines. Application and service of basic fuel, electrical, lubrication and cooling systems. 2 lectures, 2 activities.

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 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 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. 2 activities.

IT 326 Product Evaluation (2)

Practical application of value engineering and production quality control techniques to industrial products, and value analysis to company operations in relation to customer needs. 1 lecture, 1 activity. Prerequisite: Junior standing.

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. 2 lectures, 1 activity. Prerequisite: IT 125, CHEM 122

IT 330 Fundamentals of Industrial Packaging (3)

An overview of packaging: the historical development, the functions, and the 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 Industrial Electrical Systems (4)

Industrial applications of electrical concepts in distribution systems, industrial wiring, illumination, motors and controllers. Field trips, 3 lectures, 1 laboratory. Prerequisite: IT 237, 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 (3)

Fundamentals of analog computers, electronic data processing machines, and numerical control of machine tools. Applications in production supervision, sales, and industrial education, fundamentals of logic and logic circuits, simulation. 2 lectures, 1 laboratory. Prerequisite: IT 237, or consent of instructor.

IT 334 Industrial Packaging: Systems (3)

Technical interrelationships of industrial packaging: design, materials, quality control, packaging and product manufacturing, labeling, handling, storage, transportation and marketing. 2 lectures, 1 activity. Prerequisite: IT 408 or GRC 330 or senior standing.

IT 336 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 337 Advanced Plastics Processes (3)

Primary plastic processing techniques; principles. Operation of extrusion, thermoforming, rotational molding, injection molding, compression molding, and blow molding equipment. Product diagnosis. 1 lecture, 2 activities. Prerequisite: IT 327.

IT 339 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 346 Industrial Design (2)

Applications of design principles to products of industry; development of a creative, problem-solving approach to design as it applies to industrial products. 1 lecture, 1 activity.

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 the construction, repair, maintenance, and use of laboratory equipment. Primarily for students intending to become industrial education teachers. Total credit limited to 4 units with not more than 2 units any one quarter. 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. 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 (2)

Customer contacts; personal relationships, ethics, legal relationships, service contracts, communication channels. 2 lectures. Prerequisite: MKTG 204. Senior standing or consent of instructor.

IT 405 Industrial Marketing (2)

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. 2 lectures. Prerequisite: MKTG 204 or 301. Senior standing or consent of instructor.

IT 406 Cost Reduction and Control (3)

Application of cost control procedures at the foreman level. Techniques of cost reduction. Goals in reducing waste of material and defects in workmanship. 3 lectures. Prerequisite: Senior standing.

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, 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 activity. Prerequisite: IT 330, PHYS 121, CHEM 121, 111, 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 activity. Prerequisite: IT 330, PHYS 121 or equivalent.

IT 410 Drafting: Industrial Education (3)

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. 1 lecture, 2 activities. Prerequisite: IT 444 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. 3 activities. Prerequisite: IT 245 or consent of instructor.

IT 413 Plant Maintenance Management (3)

Maintenance and repair of plant facilities, operation of utility plants and systems and furnishing of utilities services, preventive maintenance, job control systems, and other essential services. 3 lectures. Prerequisite: Senior standing.

IT 415, 416, 417 Industrial Equipment Selection (3) (3) (3)

Electrical and mechanical equipment making up the utility and production support systems of a modern industrial plant. Technical alternatives available in terms of economic choice for project profitability, capital budgeting in terms of industrial equipment planning. Forecasting of depreciation due to unusual wear, use, and technological obsolescence. 3 lectures. Prerequisite: IT 331, 432, 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 is 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, industrial crafts, metals, photography, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity.

IT 425 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. 1 lecture, 2 activities. Prerequisite: IT 250.

IT 426 Automotive Technology, Chassis (3)

Fundamental, technical, and teaching aspects of automotive suspension system, steering, braking, and other control systems. Tires and lubrication. 1 lecture, 2 activities. Prerequisite: IT 250.

IT 427 Automotive Technology, 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 428 Automotive Technology, Power Trains (3)

Advanced applications of clutches, gears, standard and automatic transmissions, drive lines, differentials and axles, lubrication and bearings. 1 lecture, 2 laboratories. Prerequisite: IT 250.

IT 429 Automotive Technology: Tune-up (3)

Theory and service of automotive systems related to engine performance. The 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 (3) (3)

Applications of basic physics to mechanical systems using the English system of units; various component systems. Steam systems, air conditioning and refrigeration systems, pneumatic and hydraulic systems, piping systems. 2 lectures, 1 activity. Prerequisite: MATH 131, PHYS 122, IT 222.

IT 433 Mechanical Systems (3)

Production equipment and systems, metals, measurement, tooling and finishes. Mass production. Production management. 2 lectures, 1 activity. Prerequisite: Junior standing.

IT 435 Industrial Packaging: Operations (3)

Technical management decisionmaking regarding packaging functions, costs, and applications trade-offs. Government regulations, economics and producer-user interface. Case studies involving critical, technical, manufacturing and marketing packaging factors dealing with materials, such as plastic, metal and wood that have extensive industry applications. 3 lectures. Prerequisite to consist of one of the following: IT 326, 408, GRC 330, or senior standing.

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. 1 lecture, 2 activities. Prerequisite: IT 327.

IT 439 Plastics Process Control (3)

Plastic processing behavior. Methods for measuring machine and plastic pressures, temperatures, and flow rates. Instrumentation for process analysis, control, and evaluation of molded part characteristics. Effects of molding variables on part quality. 1 lecture, 2 activities. Prerequisite: IT 438. Recommended: CHEM 122.

IT 441 Metal Production Processes (4)

Study of mass-production techniques; design, production planning, tolerances, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial production products. 1 lecture, 3 activities. Prerequisite: IT 233 or consent of instructor.

IT 443 General Metals (3)

A study of 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. 1 lecture, 2 activities. Prerequisite: IT 233.

IT 444 Technical Drawing: Industrial Education (4)

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, 3 activities. Prerequisite: IT 245, or consent of instructor.

IT 446 Wood Production Processes (2)

Study of 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 451 Electronics: Industrial Education (4)

Teaching applications of the principles and operation of non-linear devices such as vacuum tubes, semi-conductors and associated solid state components. Programs and experiments for the teaching of electronics at the secondary level. 3 lectures, 1 laboratory.

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IT 459 Industrial Education Seminar (1)

Preparation for individual applied research in industrial education. Philosophy, professional organizations, instructional aids, evaluation and introduction to graduate study in industrial education. 1 lecture.

IT 460 Industrial Technology Seminar (1)

Preparation for senior project. Oral presentation and discussion by students of papers on related professional topics. 1 lecture.

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. Minimum 120 hours total time. Prerequisite: IT 459 for Industrial Arts majors and IT 460 for Industrial Technology majors.

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 (1-5)

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.

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 lectures. 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 lectures. 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 lectures. 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 lectures. 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 lectures. Prerequisite: Graduate standing.

IT 580 Graduate Seminar in Industrial Education (3)

Advanced study and analysis of selected topics and problems in industrial education. 3 meetings. 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 Arts and consent of instructor.

JOUR—JOURNALISM

JOUR 118 Journalism 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 231 Advertising (3)

Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. 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)

Experience in advanced reporting and news writing with special attention to public affairs. 2 lectures, 1 two-hour laboratory. Prerequisite: JOUR 203.

JOUR 312 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)

Theory of photojournalism. The photograph as a visual statement of fact. Value of the photograph in communication of news in newspapers and magazines. Photographic news assignments. Techniques in developing news picture essays. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, ART 224.

JOUR 326 Broadcast Announcing (3)

Radio and television announcing of news, sports, special events, commentary, features, commercials, and talk and discussion. 1 lecture, 2 laboratories. Prerequisite: SP 200.

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.

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JOUR 351 Journalism Practice (2)

Credit arranged by sections as indicated by subtitle for students holding editorial, advertising, or photographic positions on such departmental publications as *Mustang Daily*, or radio station KCPR, closed circuit television, 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 lectures. Prerequisite: Junior standing.

JOUR 406 Public Relations Media (3)

Writing and editing for magazines, smaller format publications and visual presentation. 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 312.

JOUR 425 Advertising Layout and Copywriting (2)

Study of advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 two-hour laboratory.

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.

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, 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. 2 laboratories, 2 activities.

LA 201 Introduction to Landscape Architecture (2)

Survey of the profession of landscape architecture from small scale design to regional planning. Relationships between landscape architects and society and professionals in related fields. 2 lectures.

LA 203 Landscape Architectural Design Fundamentals (3)

Focus on the application of basic design fundamentals and design of environments through a series of design exercises. 3 laboratories. Prerequisite: EDES 201, 202, LA 152.

LA 231 Landscape Architecture Construction (3)

Introduction to basic principles and methods of landscape architectural construction drawings. 3 laboratories, Prerequisite: ARCE 311 or consent of instructor.

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 241 Environmental Analysis for Land Use Planning (2) (Also listed as CRP 241)

Interpretation, reading and evaluation of land and terrain descriptions including maps, air photos, soil survey, hydrologic studies, contour and land form models, ERTS satellite and U2 panoramas, topographic quads and coordinate systems for use as data sources for land use planning related activities. 2 laboratories.

LA 311 History of Landscape Architecture (3)

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: Junior standing.

LA 321 Concepts in Environmental Decision Making (3)

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 working drawings, specification, cost estimation, codes, regulations, and contractual agreements. Landscape architecture practice as a profession. 2 laboratories, 1 activity. Prerequisite: LA 231; EDES 250 for LA 341. Concurrent: LA 351, 352, 353.

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. 2 laboratories, 1 activity. 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. 2 laboratories, 1 activity. Prerequisite: LA 341, 347, 351.

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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, EDES 213. Concurrent: LA 341, 342, 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, 348, 352. Recommended or concurrent: LA 343, 441, OH 451.

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 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, 353, OH 451 for 441; fourth-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. 4 laboratories, 1 activity. Prerequisite: LA 343, 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. 4 laboratories, 1 activity. Prerequisite: LA 343, 353, senior standing. Recommended or concurrent: LA 348, 441, 442, OH 451.

LA 461, 462 Senior Project (2) (2)

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. To be completed in two consecutive quarters. 120 hours minimum total time. Prerequisite: LA 343, 353.

LA 463 Undergraduate Seminar (2)

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. 2 meetings. Prerequisite: Senior standing in degree major.

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.

MATH—MATHEMATICS**MATH 100 Mathematics for General Education (3)**

Elementary topics in mathematics and the nature of mathematics. Intended to provide an appreciation of the aesthetic and cultural values of mathematics. For students not needing the specific mathematical skills required in scientific applications. 3 lectures.

MATH 102 Agricultural Mathematics (3)

Percentage problems in soils, dairy, horticulture, poultry, feeds, discount and interest, Pearson's square, equations, formulas, 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 120. 3 lectures. Prerequisite: MATH 102.

MATH 105 Hand-Held Calculators (1)

Operation of multi-function calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

*** MATH 109 Introduction to College Mathematics (3)**

Basic mathematical skills needed in science courses; consumer mathematics. Percentage, ratio and proportion, linear equations, exponents, logarithms, simple interest, and discount. 3 lectures.

*** MATH 113 Algebra (3)**

Systems of integers: fractions; polynomials and factoring; linear equations and systems of linear equations; exponents and radicals. Exercises in problems applied to agriculture. Intended for agricultural majors. Not open to students with credit in MATH 114, 118, 120, or courses for which these are prerequisites. 3 lectures. Prerequisite: One year of high school algebra.

*** MATH 114 College Algebra (3)**

Continuation of Math 113. Quadratic equations; graphing functions; inequalities; exponential and logarithmic functions; progressions; applications to agricultural problems wherever possible. This course primarily intended for agricultural majors. Not open to students with credit in MATH 118 or 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: MATH 113 or equivalent.

*** MATH 115 Trigonometry for Agriculture (3)**

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)**

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.

* Not open to students having a grade of C or better in MATH 141 or equivalent.

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* MATH 119 Analytical Trigonometry for Engineers (3)

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)

An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular co-ordinates, 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, 143, 318 (respectively) or equivalents. 4 lectures. Prerequisite: MATH 118 and 119 or equivalent.

MATH 141 Analytic Geometry and Calculus (4)

Introduction to analytic geometry and calculus. 4 lectures. Prerequisite: MATH 118 and 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 204 Mathematics of Matrices (3)

Matrices, inverses, linear systems, characteristic values, applications. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

MATH 215 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.

* 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.

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 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 241.

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 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 Modern Elementary Mathematics (3)

Introduction to number systems. Natural numbers, whole numbers, and sets. Metric system of measurement. Nonmetric geometry and introduction to statistics. Emphasis on activity learning and application for elementary school teachers. 2 lectures, 1 activity. Prerequisite: one year of high school algebra, one year of high school geometry, three units of college mathematics and at least junior standing.

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MATH 328 Modern Elementary Mathematics (3)

Continued study of number systems. Integers, rational numbers, real numbers, finite operational systems, and elementary number theory. Functions and graphs. 3 lectures. Prerequisite: MATH 327.

MATH 329 Modern Elementary Mathematics (3)

Intuitive geometry and probability. Topics from metric and synthetic geometry. Topological concepts. Elementary probability theory and experiments. Emphasis on activity learning and applications for elementary school teaching. 3 lectures. Prerequisite: MATH 328.

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: At least 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.

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: At least junior standing.

MATH 405 Transform Engineering Methods (3)

Applications of Z-transforms to engineering problems. The 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.

† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

† 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)

The 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 335 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.

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 at least 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 activity periods. Prerequisite: MATH 242 and either MATH 312 or MATH 381.

† MATH 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: MATH 459.

† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

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 lectures. 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 lectures. Prerequisite: MATH 382 and 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 lectures. 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 lectures. 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 lectures. Prerequisite: Graduate standing or consent of instructor.

† 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 lectures. Prerequisite: MATH 318 and graduate standing or consent of instructor.

MATH 515 Real Analysis (4)

Introduction to Lebesgue measure and integration, convergence theorems, L_p spaces, Radon-Nikodym theorem and Fubini's theorem. 4 lectures. Prerequisite: MATH 413 and 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 lectures. 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 lectures. 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 6 units. 4 lectures. Prerequisite: Graduate standing or consent of instructor.

† Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

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 meetings. 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 Mechanics (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 Mechanics (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 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 125.

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 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 318, ME 212.

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.

ME 324 Kinematics (4)

The study of motion in machine parts. Displacements, velocities, and accelerations in linkage, cams, gears, and other mechanisms. 2 lectures, 2 two-hour laboratories. Prerequisite: ETME 141, ME 212.

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 207, CE 229 (or concurrent), 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, 342, 136, ENVE 313.

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. Corequisite: ME 342.

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 411 Nuclear Reactors (3)

Reactor thermal and hydraulic design. Heat transfer in and from reactor elements. Pressure drop and heat transfer in two-phase flow. 3 lectures. Prerequisite: ME 341, ENVE 313, CHEM 125.

ME 412 Nuclear Reactor Engineering (4)

Advanced thermal and fast type nuclear power plants; engineering design and operational characteristics, safety analysis and environmental considerations. Course will have a subtitle description of content. May be repeated to 8 units. 4 lectures. Prerequisite: ME 411, PHYS 421.

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, 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 427 Case Studies (4)

Selected cases, illustrations and examples to stress the importance of various approaches and effects of approximations in engineering designs, computations, and judgments. 2 lectures, 2 activities. Prerequisite: ME 327, 316 or consent of instructor.

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, 327, ENGR 251.

ME 431 Mechanical Design Technique (4)

A 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, 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)

The design, operation and maintenance of surface equipment required in oil production. The 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 342, ENVE 313, ME 303, 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 302, 341, ENVE 313.

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, 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 341, ENVE 313.

ME 446 Design of Fluid Power Systems (4)

Energy transmission and control by fluid systems. Load analysis, performance specification, and system development for fluid power. Fluidics. 4 lectures. Prerequisite: ME 342.

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, ENVE 313.

ME 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.

ME 463 Undergraduate Seminar (2)

New developments, policies, practices, and procedures are discussed through regular seminar. Each individual is responsible for the development and presentation of a topic in the chosen field. 2 meetings. 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. One to three 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 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.

ME 526 Dynamics of Mechanical Systems (4)

Analysis of dynamic problems in machine design. 3 lectures and 1 two-hour activity. Prerequisite: ME 316, 324, 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.

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, 342.

ME 550 Kinematic Analysis and Design (3)

Analysis and design of mechanical linkages by means of geometric and algebraic methods. Optimization studies. 3 lectures. Prerequisite: ME 324 or equivalent.

ME 551 Mechanical Systems Analysis (3)

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 lectures. Prerequisite: 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 lectures. Prerequisite: ME 342, 303, ENVE 313, MATH 318; 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 lectures. Prerequisite: ENVE 313, ME 342, MATH 318.

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 lectures. Prerequisite: 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 121 Introduction to Metallurgical Engineering (3)**

Nature and identification of metals production, joining and working processes. Basic metallurgical laboratory techniques. Macro and micro etching and preparation of metallographic specimens. Metallurgical engineering reports, calculations associated with engineering. 1 lecture, 2 laboratories.

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 (4)

Lattice structures, cooling curves, alloy systems. Mechanical test methods, strength, ductility, modulus of elasticity. Heat treatment, isothermal transformation diagrams, steel mill, foundry and welding metallurgy. Heat and corrosion resistant metals, tool steels, stainless steel and cast iron. 3 lectures, 1 laboratory. Prerequisite: MET 306 or consent of instructor.

MET 223 Nonferrous Alloys (2)

Theory of major nonferrous alloy systems such as aluminum, copper, nickel, titanium and zirconium. Emphasis on phase relations, solid solution hardening, precipitation hardening, mechanical working, extractive metallurgy. 1 lecture, 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 non-ferrous alloys. Fabrication problems and their solution. 3 lectures, 1 laboratory. Prerequisite: Sophomore standing in Engineering Technology.

ME 301, 302, 303 Theory of Materials (4) (4) (4)

Fundamentals of material science; concepts and problems relating single and polycrystalline structure of metals to their behavior in use. Uniaxial and complex static stresses; effects of temperature and rate of loading; elastic and plastic deformation; electrical, magnetic, and thermal behavior; fatigue and creep. Statistical evaluation of experimental data. 3 lectures, 1 laboratory. Prerequisite: MATH 241, PHYS 133, ME 211, CHEM 125; ENGR 251, or consent of instructor.

MET 306 Materials Engineering (3)

Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semi conductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomenon. 3 lectures. Prerequisite: Sophomore standing in major, PHYS 132, 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. Welding metallurgy. Failure analysis and prevention, advanced metallography including electron microscopy. Theory and application of nondestructive examination. 2 lectures, 2 laboratories. Prerequisite: MET 223.

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 Advanced Theory of Materials (4) (4) (4)

Metallurgical thermodynamics; solid state transformations, mechanisms and kinetics. Theory of alloying, diffusion, dislocations, plastic deformation, strengthening mechanisms, precipitation hardening, martensitic reactions, and solidification. Metallurgical computations. 4 lectures. Prerequisite: MET 303, 326, CHEM 306.

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. 2 lectures, 1 laboratory. Prerequisite: MET 303, 326, CHEM 306.

MET 434 Welding Engineering (3)

Weldability studies of high strength, low alloy steels and the important metallurgical aspects of welded fabrication. 1 lecture, 2 laboratories. Prerequisite: MET 306.

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 Failure Investigation Lab (1) (1) (1)

Investigation of actual service failures; applied metallography and photomicrography; detailed theoretical analysis of design and service parameters pertinent to the failed component; preparation and defense of formal engineering reports. 1 laboratory. Prerequisite: Concurrent enrollment in MET 424, 425, 426 or consent of instructor.

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 463 Undergraduate Seminar (2)

Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments. 2 lectures. Prerequisite: Senior standing.

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. One to three laboratories. Prerequisite: Consent of instructor.

MET 500 Individual Study (1-3)

Advanced study planned and completed under 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 lectures. Prerequisite: MET 306 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 lectures, 1 laboratory. Prerequisite: MET 306, CE 208, and graduate standing.

MFGE—MANUFACTURING ENGINEERING**MFGE 233 Computer Aided Manufacturing (2)**

Manual and computer programming systems for machining operations. Verification of control tapes by plotter techniques. Computer control in manufacturing utilizing IBM 360 and UNIAPT computer systems for machine control tape generation. 1 lecture, 1 laboratory. Prerequisite: ETME 142, ETMP 144, MATH 142, ENGR 251, IE 251.

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MFGE 334 Machine Processing (3)

Design and management concepts in numerical control of machine tools and industrial processes. APT programming for continuous path machining. Large computer vs. micro-processors. Program verification and operation of machine tools. 2 lectures, 1 laboratory. Prerequisite: MFGE 233.

MFGE 424 Engineering Test Design and Analysis (3)

Design and statistical analysis of engineering experiments. Experimental methods for evaluation and comparison; accelerated, sequential, and nonparametric tests; interpretation of interference, fatigue, and field data; Weibull renewal analysis and warranty data. 3 lectures. Prerequisite: STAT 321 or equivalent, IE 304.

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)

The 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)

The purchasing function applied to manufacturing, retailing, and food-service institutions. The purchasing function and its interdependence with other functional areas of the organization. 3 lectures. For nonbusiness majors.

MGT 302 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 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.

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)

An 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)

The 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.

MGT 314 Human Resources Management (4)

The personnel function as it relates to the management of the human resources of the organization. A survey of employee/employer relations, the work environment, employee behavior and development and labor relations. 4 lectures. Prerequisite: Junior standing.

MGT 315 Advanced Personnel Management (4)

Managerial functions related to the procurement, development, maintenance, and utilization of people in the work environment. 4 lectures. Prerequisites: MGT 314, or consent of instructor.

MGT 316 Labor Contract Administration (4)

Resolution of problems involving disputes between individuals, unions and companies. Simulation techniques designed to present material both orally and in writing in a creative, logical rational manner. 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 organizations. 4 lectures. Prerequisite: Junior standing.

MGT 319 Wage and Salary Administration (4)

Management of compensation systems. Job analysis-job descriptions-job evaluations, employee evaluation, wage and hour legislation, incentive systems, theory, rationale, and practice of compensation. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

MGT 321 Quantitative Business Analysis and Applications of Data Processing (4)

Application of computer and quantitative techniques in business and industry. Data bases and management information systems. Allocation of resources models, game theory, simulation, network analysis, forecasting; relationship of the computer to the management decision-making process. 4 lectures. Prerequisite: MATH 221, STAT 252 and junior standing.

MGT 322 The Management Information System (4)

Characteristics of a Management Information System. Justification for an information system. Systems analysis and design. Determination of management requirements. Development and implementation of an information system. The management decisionmaking process and the Management Information System. The Data Base. Project analysis. 4 lectures. Prerequisite: MGT 321 or consent of instructor.

MGT 323 Simulation of Management Decisionmaking (4)

The simulation of business problems for management decisionmaking. The types of business simulators. Use of the computer in simulation. The 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 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 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 or consent of instructor.

MGT 410 Employee Benefits (4)

Employee benefit programs in the private sector. History, theory, rationale, and contents of benefits. Effects on payroll and other costs, contract negotiations, employee relations, pensions, hospitalization insurance, thrift plans, bonuses, profit sharing, worker's compensation, non-hospitalization insurance plans, et al. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

MGT 412 Contract Negotiation in Collective Bargaining (4)

Collective bargaining and the relationship between management and labor leading to the development of a contract. 4 lectures. Prerequisite: Junior standing.

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. Integrating course of the core curriculum. 4 lectures. Prerequisite: All 300-level Business core courses.

MGT 418 Quantitative Methods and Controls in Business (3)

Basic principles of quantitative controls as applied to the fundamental operations of business. For the senior student who needs descriptive and operational knowledge as a background for application in business analysis and decision. 3 lectures. Prerequisite: Senior standing or consent of instructor.

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 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.

MGT 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.

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 302 or consent of instructor.

MGT 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. Prerequisite: Formal petition with approval.

MKTG—MARKETING**MKTG 204 Elements of Marketing (4)**

An overview of the marketing institutions and the function of marketing in the economic, socio-cultural and political-legal environments. 4 lectures. Prerequisite: ECON 201 or 221 or equivalent, or consent of instructor. Not acceptable for credit toward Business Administration degree.

MKTG 301 Principles of Marketing (4)

A basic course in marketing that examines marketing's role in society and the management of the product, promotion, pricing and channel strategies of the firm. 4 lectures. Prerequisite: ECON 222, STAT 252, and junior class standing.

MKTG 302 Marketing Information and Analysis (4)

The analysis of target markets, estimating market potential, identifying secondary and primary information sources, and forecasting sales. 4 lectures. Prerequisite: MKTG 301.

MKTG 303 Buyer Behavior (4)

The applied study of behavior that affects marketing decisions in both consumer and industrial markets. 4 lectures. Prerequisite: MKTG 302.

402 MKTG—MSC

MKTG 304 Channels and Physical Distribution (4)

The selection, evaluation and control of channels of distribution and the 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)

The management of the field sales force, including the 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 466 Marketing Problems Seminar (4)

Application of modern methods to the exploration and analysis of current and potential marketing trends, opportunities, and problems. 4 meetings. 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 101 (MS-I) U.S. Defense Establishment (1)

Organization and functions of the U.S. defense establishment; roles of the military services; U.S. Army today; military rank and branches of the Army; history of ROTC; role of commissioned officers; military customs. 1 lecture.

MSC 102 (MS-I) Early American Military History (1)

Overview of American military history from the colonial period to 1902; application of the principles of war concentrating on significant battles of the American Revolution and the Civil War. 1 lecture.

MSC 103 (MS-I) Modern American Military History (1)

Overview of American military history from 1902 to the present; application of the principles of war concentrating on significant battles of WWI and WWII. 1 lecture.

MSC 201 (MS II) Orienteering (2)

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. 2 lectures.

MSC 202 (MS II) Basic Military Tactics (2)

Dynamics and organization of the modern battlefield; organization of small military units and their employment; introduction to military equipment. 2 lectures.

MSC 203 (MS II) Basic Leadership and Management (2)

Principles of leadership; functions and theories of management; decisionmaking process; and, utilization of management tools. Case studies utilized to provide practical application of theory. 2 lectures.

MSC 205 Basic Camp (1-7)

Same material as MSC 101, 201, 202, and 203. 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 301, 302, 303 (MS III) Advanced Leadership and Management (3) (2) (3)**

Application of management skills within the context of realistic simulation exercises; map reading and applied leadership instruction through coordinated group effort; theory and dynamics of small unit tactical operations. MSC 301: 3 lectures. MSC 302: 2 lectures. MSC 303: 3 lectures.

***MSC 401, 402, 403 (MS-IV) Selected Topics in Military Leadership (3) (3) (1)**

Role of the U.S. Armed Forces in National Defense Strategy. Group dynamics and the practical application of teamwork to problem solving. Theory and application of military law within the Military Judicial System. Class schedule will list major subject area. MSC 401: 3 lectures. MSC 402: 3 lectures. MSC 403: 1 lecture.

MU—MUSIC**MU 100 Music Fundamentals—Applied (3)**

The study of 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 Theory I (3)

Elements of music theory covering: notation, construction of major and minor scales and keys, signatures, intervals, diatonic triads, triad forms, inversions, study of meter and rhythm, elementary ear training. 3 lectures.

MU 102 Ear-Training and Sight-Singing (1)

A systematic development of skills in reading musical notation. Students are taught to hear mentally what they see and to reproduce rhythm and pitch accurately through singing. 1 activity.

MU 103 Rhythm Skills (1)

The study of 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)

A 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.

* Students who are participants in the ROTC program are required to take for no additional academic credit four hours per month of field instruction in applied leadership and management.

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 repertory, 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 the 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 167 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 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, 205 Appreciation (3) (3)

Introduction to the elements and concepts of music, leading to greater understanding of art music. Discussion of the styles, forms, and specific composers. May be taken in any order. 3 lectures.

MU 209 Jazz Styles (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)

Study of the 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)

Study of the 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 (2)

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, 309 Conducting (2) (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. Admittance 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)

Study of the 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)

Study of the 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)

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. 3 lectures.

MU 407 Contemporary Music Theory (3)

Survey of theoretical concepts in 20th century music. Analysis of melodic, harmonic, and rhythmic procedures of selected composers. 3 lectures. Prerequisite: MU 303 or consent of instructor.

MU 437 Advanced Voice—Performance and Literature (1)

Songs from the Baroque to Contemporary periods will be studied, with advanced students performing in a master class-type setting. Study of the song literature will include analysis of the text and music, language diction, and vocal technique. Total credit limited to 3 units. Prerequisite: MU 337 or consent of instructor.

NRM—NATURAL RESOURCES MANAGEMENT

NRM 101 Introduction to Natural Resources Management (3)

Natural resources of the United States: forests, minerals, water, wildland and wildlife. Development, management, and utilization of our natural resources for the continuous benefit of man and conservation of the resources. 3 lectures.

NRM 112 Introduction to 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 Introduction to 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 130 Forest Resources (3)

Fundamentals of forestry including basic silviculture, forest protection, and multiple use of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

NRM 203 Resource Law Enforcement (3)

Law enforcement applied to natural resource conservation. Development of laws; laws of arrest, search, and seizure; rules of evidence; court structure; and court procedures. Laws of parks, forestry, wildlife, and water quality control. 3 lectures.

NRM 207 Resource Survey (3)

Survey, inventory and assessment techniques applicable to natural resource fields. Vegetation survey, animal censusing, and questionnaire survey. 2 lectures, 1 laboratory.

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NRM 210 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: NRM 120 or consent of instructor.

NRM 212 Site Development and Maintenance (4)

Basic planning and design principles of selected outdoor recreation sites. Area layout, facility design, construction, and maintenance of structures, grounds, roads, and trails. 3 lectures, 1 laboratory. Prerequisite: NRM 112.

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 230 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. 2 lectures, 2 two-hour laboratories. Prerequisite: BOT 123.

NRM 232 Resource Fire Control (4)

Study of wildland fuels, fire behavior, fire danger ratings, and fire suppression methods in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. 2 lectures, 2 laboratories. Prerequisite: NRM 130 or consent of instructor.

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. 3 lectures. Prerequisite: NRM 112, 120, 130.

NRM 304 Ecology of Resource Areas (4)

Dynamics of energy flow and nutrient cycles at the community and ecosystem level, and an investigation of man's role as the primary factor of change in the world's natural resources. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or consent of instructor.

NRM 307 Environmental Impact Analysis (3)

A study of the 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 will be presented and examined through recent court decisions and emerging case law. 3 lectures. Prerequisite: Junior standing.

NRM 310 Management of Outdoor Recreation Users (3)

The examination of outdoor recreation user behavior through application of behavioral science principles and techniques. The use of behavioral information will be made for the planning, management, and maintenance of outdoor recreation areas. 3 lectures. Prerequisite: NRM 112, 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: NRM 304, BOT 123, and SP 200; or consent of instructor.

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. Prerequisites: NRM 112 and NRM 304.

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 331 Fire Ecology (3)

Study of fire weather, fire effects, prescribed use of fire in management; policy and objectives or fire management organizations. 2 lectures, 1 laboratory. Prerequisite: NRM 304, ecology course, or consent of instructor.

NRM 332 Forest Products (4)

Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. 3 lectures, 1 laboratory. Prerequisite: PHYS 121, NRM 130, 230.

NRM 333 Forest Harvesting (4)

Study 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 Resource Management concentration or consent of instructor.

NRM 334 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, and growth projection. 3 lectures, 2 laboratories. Saturday field trips required. Prerequisite: MATH 115, STAT 212, and AE 238.

NRM 336 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.

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. 3 lectures. Prerequisite: ECON 212, NRM 302.

NRM 403 Resource Law Methods (3)

Problems, situations, and techniques in natural resource law enforcement. Patrol procedures; evidence collection and preservation; case presentation; human and public relations. 3 lectures. Prerequisite: NRM 203.

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 304, STAT 212, ENGL 304.

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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, and consent of instructor.

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, 304, and 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 lectures, 1 laboratory. Prerequisite: NRM 311.

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. 3 lectures. Prerequisite: NRM 112.

NRM 420 Culture of Warmwater Fishes (4)

Management of a production fish hatchery. Facility design, water supply, quality, and control; production regimen; and process methods for warmwater game, food, and bait fishes. 3 lectures, 1 laboratory. Prerequisite: NRM 320.

NRM 421 Culture of Coldwater Fishes (4)

Propagation and production of trout, salmon, and other cold-water fishes. Site selection, design and operation of hatcheries; raceways and closed system production units. Spawning, feeding, harvesting, and transportation techniques used in the culture of coldwater 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 BIO 325.

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: NRM 120, BOT 123 and ZOO 323 recommended.

NRM 430 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: NRM 230.

NRM 432 Urban Forestry (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: NRM 230.

NRM 433 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: NRM 334 and 430.

NRM 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: NRM 130, 230, and 332.

NRM 435 Forest Valuation (3)

Wildland and timber appraisal, wildland taxation. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 3 lectures. Prerequisite: NRM 401, 430.

NRM 440 Watershed Management (4)

Principles and methods of management of chaparral, range, and forest land for optimum production and regulation of water yields and resource utilization and protection. 3 lectures, 1 laboratory. Saturday field trips required. Prerequisite: SS 121, and NRM 304 or BIO 325.

NRM 441 Forest and Range Hydrology (4)

Influence of forest and range vegetation on wildland water resources evaluation and controls. Techniques of managing wildlands for increases in usable water yields. 3 lectures, 1 laboratory. Prerequisite: NRM 440.

NRM 442 Watershed Protection (3)

Introduction to watershed protection and rehabilitation; use of small structures and planting techniques. Analytical evaluation and prediction of watershed disturbances. Field trips required. 3 lectures. Prerequisites: NRM 440, AE 345.

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 lectures.

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 lectures. Prerequisite: Graduate standing and 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 lectures. Prerequisite: Graduate standing and consent of instructor.

OH—ORNAMENTAL HORTICULTURE

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 102 Principles of Landscape Design II (3)

Basic principles of landscape design related to problem solving, plant composition and layout. Exposure to the design process. 1 lecture, 2 laboratories. Prerequisite: OH 101.

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. 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 (4)

Introduction to basic equipment and techniques in floriculture, floral design and landscape maintenance. Effects of environment on plant growth and relationships to commercial applications. 3 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, 132.

OH 145 Bonsai Culture (2)

Study of the philosophy, history, training, culture, production, and care of the Japanese Bonsai. 1 lecture, 1 activity.

OH 152 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 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 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)

For non-horticulture 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. Prerequisite: OH 121.

OH 251 Ikebana (3)

Techniques of the ancient art of Ikebana as it influences western floral design. 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. 2 lectures, 1 laboratory.

OH 253 Stylized Western Design (3)

Techniques of western stylized line design as it is known currently. 2 lectures, 1 laboratory. Prerequisite: OH 132.

OH 320 Landscape Media (3)

Various media essential to presentation of landscape design used in the industry. Basic techniques of design presentation involving plan, elevation, section and detail drawings, model construction and photography. Required field trip. 1 lecture, 2 laboratories. Prerequisite: OH 101, 102.

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)

Principles of landscape design of large scale properties and the application of these principles in solving of landscape design problems. 2 lectures, 2 laboratories. Prerequisite: OH 102, and two Plant Materials courses.

OH 324 Tropical Plant Culture (4)

The identification, propagation, production, marketing, utilization and maintenance of plants intended for interior landscaping. 3 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

OH 327 Diseases and Pests of Ornamental Plants (4)

A detailed study of 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. 2 lectures, 2 laboratories. Prerequisite: OH 132.

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OH 329 Advanced Floral Design (4)

Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. 2 lectures, 2 laboratories. Prerequisite: OH 328.

OH 330 Flower Arrangement (2)

Principles and uses of flower arrangements as used in home and party decorating. 1 lecture, 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, 102, 126.

OH 332 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. The rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. 3 lectures, 1 laboratory. Prerequisite: OH 101, 102, 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, 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)

The 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)

The 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 402 Garden Center Management (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 211, ACTG 131, junior or senior standing, or consent of instructor.

OH 421 Arboriculture (4)

The care and management of large ornamental trees. The use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 231, 232, 233.

OH 424 Container Plant Production (4)

Commercial container plant nursery operations, including growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control, and marketing. 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. 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. Prerequisites: senior standing, OH 327 and consent 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 451, 452 Implementation of Landscape Design (2) (2)

Planting design related to soils and fertilizers, disease and pest prevention, maintenance and growth factors. Landscape design and specification writing, estimating, installation. 2 laboratories. Prerequisite: Junior standing in Landscape Architecture or Ornamental Horticulture.

OH 454 OH Irrigation Systems (4)

Irrigation system design with emphasis on landscape, nursery and specialized systems, materials and installation. 2 lectures, 2 laboratories. Prerequisites: OH 101, 102, AE 337 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, 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 463 Undergraduate Seminar (2)

An open forum of senior students in which participants reflect on the learning accomplished through their university experience and discuss current professional practices, procedures, and developments in the OH industry. Career planning information, techniques, and job search strategies are presented. Each student is responsible for the development and presentation of a topic in his or her chosen field. 2 lectures. Prerequisite: A completed OH 462, senior project.

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. One to three 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.

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 satisfy the General Education-Breadth requirement, 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 100-165) are evaluated on a Credit/No Credit basis.

Coed

PE 100 Adaptive Activity	PE 108 Basketball
PE 101 Apparatus, Beg.	PE 109 Bowling
PE 102 Apparatus, Int.—Adv.	PE 110 Cycling
PE 103 Archery	PE 111 Fencing, Beg.
PE 104 Badminton, Beg.	PE 112 Fencing, Int.—Adv.
PE 105 Badminton, Int.—Adv.	PE 114 Field Hockey, Beg.
PE 106 Ballet, Beg.	PE 115 Field Hockey, Int.—Adv.
PE 107 Ballet, Int.—Adv.	PE 116 Figure Control

- PE 117 Flag Football
- PE 118 Folk Dance
- PE 119 Handball, Beg
- PE 120 Handball, Int.—Adv.
- PE 121 Golf, Beg.
- PE 122 Golf, Int.—Adv.
- PE 123 Jazz Dance, Beg
- PE 124 Jazz Dance, Int.—Adv.
- PE 125 Jogging
- PE 126 Judo
- PE 127 Modern Dance, Beg.
- PE 128 Modern Dance, Int.—Adv.
- PE 129 Hatha Yoga
- PE 130 Orienteering
- PE 131 Physical Conditioning
- PE 132 Racquetball, Beg.
- PE 133 Racquetball, Int.—Adv.
- PE 136 Skin-Scuba Diving
- PE 137 Self-Defense
- PE 138 Rugby
- PE 139 Soccer, Beg.
- PE 140 Soccer, Int.—Adv.
- PE 141 Social Dance
- PE 142 Softball
- PE 143 Life Saving, Adv.
- PE 144 Swimming, Beg.
- PE 145 Swimming, Int.
- PE 146 Swimming, Adv.
- PE 147 Team Handball
- PE 148 Tennis, Beg.
- PE 149 Tennis, Int.—Adv.
- PE 150 Tumbling-Vaulting
- PE 151 Volleyball, Beg.
- PE 152 Volleyball, Int.—Adv.
- PE 153 Water Polo
- PE 154 Weight Training
- PE 156 Aqua-Calisthenics
- PE 158 Synch. Swimming
- PE 159 Wrestling
- PE 174 Coed Intramurals
- PEM 175 Men's Intramurals
- PEW 176 Women's Intramurals

Competitive Athletics

Enrollment limited to those qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 unit and meet for a minimum of 10 hours per week.

Coed	Men	Women
PE 181 Fencing.....	PEM 182 Baseball	PEW 183 Basketball
	PEM 183 Basketball	PEW 184 Cross Country
	PEM 184 Cross Country	PEW 187 Gymnastics
	PEM 185 Football	PEW 190 Softball
	PEM 189 Soccer	PEW 191 Swimming
	PEM 191 Swimming	PEW 192 Tennis
	PEM 192 Tennis	PEW 193 Track and Field
	PEM 193 Track and Field	PEW 194 Volleyball
	PEM 194 Volleyball	
	PEM 195 Water Polo	
	PEM 196 Wrestling	

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 advisor 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 207 Apparatus (2)
- PE 208 Golf (1)
- PE 210 Tennis (1)
- PE 211 Softball-Baseball (1)
- PE 212 Handball/Racquetball (1)

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| PE 213 Basketball (1) | PE 222 Archery (1) |
| PE 214 Volleyball (1) | PE 223 Cross Country and Track Events (1) |
| PE 215 Field Sports (Soccer, Speedball, Speed-away) (2) | PE 224 Field Events (1) |
| PE 216 Wrestling (1) | PE 225 Team Handball (1) |
| PE 217 Flag Football/Football (1) | PE 226 Field Hockey (1) |
| PE 218 Aquatics (2) | PE 229 Badminton (1) |
| PE 221 Combatives/Self Defense (1) | |

Academic Courses

Professional courses designed primarily for the student majoring in physical education. Course 250 may be used in partial satisfaction of the General Education-Breadth requirement in physical education.

PE 240 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies, or other selected problems. Total credit limited to 4 units with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

PE 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)

An 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 260 Intramural Sports (3)

Principles and policies underlying programs of intramural sports in secondary schools and community centers. 2 lectures, 1 two-hour laboratory.

PE 270 Introduction to Physical Education (2)

Designed to acquaint the student with 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)

A 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 292 Officiating Gymnastics (1)

Development of judging technique in gymnastics. 1 two-hour laboratory.

PE 294 Officiating Track & 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 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, 239.

PE 305 Drug Education (2)

Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restrictive 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 and 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 Women's Gymnastics (3)

Techniques and problems in teaching women's gymnastics. Practical experience in organizing interscholastic women's gymnastics. Theories of coaching principles and analysis of stunts. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 206, 207, or consent of instructor and PE 296.

PE 358 Teaching and Coaching Men's Gymnastics (3)

Techniques and problems in teaching men's gymnastics. Practical experience in organizing interscholastic men's gymnastics. Theories of coaching principles and analysis of sports. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 206, 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, 224, or consent of instructor and PE 296.

PE 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.

PE 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 laboratories. Prerequisite: PE 127 or 128, PE 244 or consent of instructor and PE 296.

PE 385 Choreography (3)

Problems connected with dance composition and choreography. 1 lecture, 2 two-hour laboratories. Prerequisite: One year dance experience or consent of instructor.

PE 386 Stage Dance Production (3)

Stage dance production for public performances. Rehearsing, costuming, sets, prop lighting. 1 lecture, 2 two-hour laboratories. Prerequisite: PE 385 or consent of instructor.

PE 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 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)

An 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)

A 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 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 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 440 Activity Supervision (1)

Required of physical education majors enrolled in the teaching option. Emphasis will be given to class organization of required physical education classes. Total credit limited to 3 units. 2 one-hour periods. Prerequisite: Senior standing and 300-level methods courses.

PE 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: PE 302, 303, 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 lectures. Prerequisites: PE 406, 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 lectures.

PE 511 Administration of Physical Education (3)

Principles and techniques of administration of physical education on the elementary and secondary school levels. 3 lectures.

PE 512 Critical Health Issues (3)

Contemporary health issues and related information. Adaptability of scientific health discoveries to current patterns of living. 3 lectures.

PE 513 Evaluation of Current Studies (3)

Analysis and evaluation of published studies in physical education, health education and recreation. 3 lectures. Prerequisite: PE 517.

PE 516 Physical Education Facilities, Equipment and Finance (3)

Design and construction of physical education facilities. Budgeting and financing physical education, intramural, and athletic facilities and programs. 3 lectures. Prerequisite: Graduate standing.

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 lectures. 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 lectures. Prerequisite: PE 302, 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 lectures.

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 lectures.

PE 530 Advanced Physiology of Exercise (3)

Effects of exercise on human beings in relation to performance and physiological adjustment to activity. 3 lectures. Prerequisite: PE 303.

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 lectures.

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 lectures. Prerequisite: Graduate standing or consent of instructor.

PE 599 Thesis (2) (2) (2)

Independent research under the guidance and supervision of the staff. Prerequisite: PE 517, consent of graduate adviser and supervising faculty member.

PHIL—PHILOSOPHY**PHIL 101 Introduction to Philosophy (3)**

A sampling of the problems, arguments, methods, and schools of philosophy. 3 lectures.

PHIL 221 Traditional Logic (3)

The relation between logic and language. The nature, recognition, and avoidance of the common informal fallacies. Classical logic including immediate inferences, syllogisms, and enthymemes. 3 lectures.

PHIL 222 Modern Logic (3)

Techniques of formal reasoning. Deductive techniques of propositional and predicate logic. 3 lectures.

PHIL 223 Critical Thinking (3)

Brief survey of the relation of language to logic. Analysis and criticism of arguments in ordinary language. Techniques of inductive and deductive argumentation as ways of advancing our knowledge and examining the grounds of our beliefs. Formal and informal fallacies in reasoning. 3 lectures.

PHIL 305 Western Religions (3)

Judaism, Christianity, Islam. Beliefs, ethics, religious practices and history of Western and near Eastern world religions. 3 lectures.

PHIL 306 Eastern Religions (3)

Religions and life-view philosophies of the Far East and India, including Buddhism, Hinduism, Taoism, Confucianism. Beliefs, ethics, religious practices of contemporary Far Eastern and Indian religions and significant historical developments leading to modern forms of these religions and philosophies of life. 3 lectures.

PHIL 307 Philosophy of Religion (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.

PHIL 311 History of Greek Philosophy (3)

Beginnings of Western science and philosophy. Pre-Socrates, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures.

PHIL 313 History of Modern Philosophy (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.

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PHIL 315 Contemporary Philosophy (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.

PHIL 321 Philosophy of Science (3)

The 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.

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: PHIL 221 or 222.

PHIL 331 Ethics (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.

PHIL 333 Political Philosophy (3)

Philosophic foundation of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures.

PHIL 335 Social Ethics (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.

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)

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 or 114 or 120.

PHYS 121 College Physics (4)

An introductory course in mechanics emphasizing motion, force, and energy. Not open for credit to students having credit for PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 115 or 120.

PHYS 122 College Physics (4)

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 credit for PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

PHYS 123 College Physics (4)

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 credit for PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

PHYS 131 General Physics (4)

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.

PHYS 132 General Physics (4)

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)

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, (PHYS 132 recommended), MATH 132 or 143.

PHYS 134 General Physics (3)

Magnetic properties of matter, Maxwell's equations, electromagnetic waves, radiation, physical optics. 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 206, 207 Instrumentation in Experimental Physics (2) (2)

Electrical and electronic circuit elements, operational amplifiers, and digital techniques including logic, counting, and analog-digital converters with applications to instrumentation in modern physics. 2 lectures. Prerequisite: PHYS 133, MATH 143, and concurrent enrollment in PHYS 256, 257.

PHYS 210 Introduction to Modern Physics (4)

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)

Fundamental principles of modern physics, emphasizing atomic and quantum phenomena. Introduction to special relativity; wave-particle duality; Bohr theory; Schroedinger equation; elementary atomic structure. 4 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, MATH 133 or 241.

PHYS 213 Introduction to Nuclear Physics (3)

Nuclear radiations and interactions. Detection methods, instruments and radioactive hazards. Nuclear reactions and induced radioactivity. Nuclear energy. 3 lectures. Prerequisite: PHYS 211.

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PHYS 215 Physics of Sound and Music (3)

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)

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 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.

PHYS 301 Statistical Physics and Heat (3)

Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: PHYS 132, 210 or 211, MATH 241.

PHYS 302 Analytic Mechanics (3)

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)

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)

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 122 and MATH 143 or 133 or equivalent.

PHYS 315 Introduction to Lasers and Laser Applications (3)

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisites: PHYS 133 or EL 207 or equivalent, or PHYS 123 with MATH 133 or MATH 143.

PHYS 317 The Special Theory of Relativity (3)

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 211.

PHYS 323 Physical Optics (4)

Survey of geometrical optics. Interference, Fraunhofer diffraction, Fresnel diffraction, polarization. Selected topics in modern optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 134, 210 or 211, MATH 241, or consent of instructor.

PHYS 341, 342 Quantum Physics Laboratory (1) (2)

Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory (341), 2 laboratories (342). 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 meetings.

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)

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, 405.

PHYS 405 Quantum Mechanics (3)

The wave nature of matter. The wave function and its interpretation. The Schrodinger 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 semi-conductors. 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)

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)

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 semi-conductors. 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, 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.

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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)

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 the replacement program. 3 lectures, 1 laboratory.

PI 123 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.

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)

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 223 Poultry Incubation (2)

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. 1 lecture, 1 laboratory.

PI 230 General Poultry Production (3)

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 (2)

Structural aspects and normal functions of the principal systems of domestic poultry. 1 lecture, 1 laboratory. Prerequisite: ZOO 131 or BIO 100.

PI 233 Poultry Plant Design and Equipment (2)

Design and planning a modern commercial poultry operation. The 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)

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)

Field trips and basic skills in propagation and management in support of PI 305. 1 laboratory. Prerequisite or concurrent: PI 305.

PI 321 Applied Poultry Breeding (3)

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.

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 (3)

Management, sanitation and vaccinating programs for the maintenance of the flock health. Control and prevention of diseases and parasites. 3 lectures. Prerequisite: BACT 221.

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 421 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 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.

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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 meetings.

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 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 530 Poultry Business Dynamics (3)

Organizational structure of modern poultry industry. Economic integration of production, processing, and marketing. Role of poultry and poultry products in the economic and nutritional health of state and nation. 3 lectures. Prerequisite: Graduate standing and consent of instructor.

PI 581 Graduate Seminar in Poultry (3)

Current trends and characteristics of the poultry industry enterprise. Group discussions of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 meetings.

POLS—POLITICAL SCIENCE

POLS 099 U.S. History and Government (3)

Basic structure and operation of the federal government. The constitution as a modern regulatory instrument; bases of American ideals. Function of state and local government. This course may not be substituted for HIST 204, 205, POLS 201 or 401. 3 lectures. Not open to degree students for degree credit.

POLS 100 Introduction to Political Science (3)

Introduction to the scope, language, and concepts of the discipline of political science. Examination of issues as a means of demonstrating various approaches in the discipline. 3 lectures.

POLS 101 National Government (3)

Governmental institutions of the United States. Basic concepts, policy issues, structural elements and functions of the national government. Completion of POLS 101 and 102 will satisfy the California state requirements in the United States Constitution, state and local government. 3 lectures.

POLS 102 California Government (3)

California state and local political institutions and problems. Processes, structure and function of policy making at the state and local level. Completion of POLS 101 and 102 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 107 Contemporary Political Issues (3)

Major public policy issues facing America. Emphasis on class discussion of vital topics of public policy, both domestic and international, placed in the context of the study of political science. 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 201 American and California Government (3)

The origin, nature, and distribution of political power. Declaration of Independence. The Constitution of the United States. Function and current problems of national, state and local government. Finding and evaluating authoritative source materials on political affairs. Not open to students with credit in or enrolled in POLS 101. 3 lectures.

POLS 202 Comparative Politics (3)

Comparative study of the government of the United Kingdom and other selected Western European countries. 3 lectures. Prerequisite: POLS 101 or 201.

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. The social and political theories of thinkers from Socrates to Machiavelli. 3 lectures.

POLS 206 Judicial Process (3)

An 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 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 activities. Prerequisite: One course in POLS or consent of instructor.

POLS 270 Politics Through Films (2) (CR/NC)

The political process as depicted through films. The way films (and secondarily, the mass media) affect perception and understanding of political processes. Class schedule will list topic. Total credit limited to 4 units. 1 lecture-recitation, 1 laboratory. Credit/No Credit grading.

POLS 301 The Politics of Energy and Science (3)

Political, economic, technical and ethical problems of energy and scarce resources. Exploration of energy crisis in historical setting. Politics and economics of alternative energy sources. Role of government in developing alternative sources, land management, research funding and regulation. Interdisciplinary approach. 3 lectures. Prerequisite: POLS 101 or 201.

POLS 302 American Political Process (3)

Political parties, pressure groups, public opinion and the role of each in contributing to the dynamics of the American political process. 3 lectures. Prerequisite: POLS 101 or 201.

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 101 or 201.

POLS 304 Politics of Global Survival (3)

An 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 101 or 201 or HIST 205.

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POLS 305 Political Analysis (5)

An 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 labs. 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 201.

POLS 307 American Political Thought (3)

The central political ideas of America's leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: POLS 201, 204.

POLS 308 Revolutions and Collective Violence (3) (Also listed as SOC 308)

The course focuses on the causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events will be the main object of study, 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)

The 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 201, 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. The impact of national strategy on both national and international politics. 3 lectures. Prerequisite: POLS 105 or 201 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 101 or 201.

POLS 319 Public Personnel and Finance Administration (3)

Processes of recruiting and managing personnel in the public service. Philosophy of public personnel administration, civil service system, labor issues. Theory and practice of public finance administration. Examination of the budget as an instrument of public policy. 3 lectures. Prerequisite: POLS 101 or 201.

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 101 and 102, or 201.

POLS 322 Protection of 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 101 and 102, or POLS 201.

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 101 or 201.

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 101 or 201.

POLS 340 Government Internship (1-12) (CR/NC)

Supervised work experience in a government or related public agency as approved by the School Dean. The 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 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 activities. Prerequisite: POLS 250 or consent of instructor.

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 101 or 201.

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 102 or 201.

POLS 402 Politics of Developing Areas (3)

Institutions and processes of governments in a selected world area experiencing economic and political development. Each time the course is offered it will bear a subtitle descriptive of the particular area studied. 3 lectures. May be repeated to a total of 9 units. Prerequisite: POLS 101 or 201 and HIST 205 or equivalent.

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 201.

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. The individual's role and responsibilities in a democracy. 3 lectures. Prerequisite: POLS 201 or equivalent.

434 POLS

POLS 405 Politics of Municipal Finance and Planning (3)

Political and economic considerations affecting the decision-making process of planning departments, commissions, and other local government decision-making boards. The budgetary process, interest groups, urban renewal, economic development at the subnational level. 3 lectures. Prerequisite: POLS 401 or 403 or equivalent.

POLS 411 Contemporary U.S. Foreign Policy (3)

The 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 or HIST 205.

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)

Study and 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 424 Organizing and Teaching Political Science (3)

Organization, selection, presentation, application, and interpretation of political science subject matter for teaching of high school government and civics. 3 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

POLS 442 The American Presidency (3)

The nature and problems of contemporary presidential leadership emphasizing the impact of the bureaucracy, congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: POLS 101 or 201.

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 (2)

Preparation and presentation of current developments in the field of political science. 2 meetings. Prerequisite: POLS 461, 462 or consent of instructor.

POLS 465 Middle Eastern Politics (3)

Study and 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)

Study and 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 lectures. Prerequisite: Graduate standing.

PSC—PHYSICAL SCIENCE**PSC 101 The Physical Environment: Matter and Energy (4)**

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 recitation.

PSC 102 The Physical Environment: Atoms and Molecules (4)

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)

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)

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)

Interdisciplinary approach to contemporary science-society issues such as the energy crisis, the arms race, environmental issues, nuclear power. 3 lectures.

PSC 201 Introduction to Physical Oceanography (3)

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. Not open to students with credit in PSC 301. 3 lectures.

PSC 301 Physical Oceanography (3)

Oceanic regions, waves, mechanics and dynamics of currents, Earth's heat budget, ocean margins, influence of biological and chemical processes, man's interaction with the ocean, measurements, problems of special interest. Not open to students with credit in PSC 201. 3 lectures. Prerequisite: PHYS 122 or 132 and a course in calculus.

PSC 303 Earth and Space Science (4)

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 and 102 and 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.

436 PSC—PSY

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; effective study methods, note-taking, time-planning, memory, concentration. Credit/No Credit grading. 2 lectures.

PSY 201 General Psychology (3)

Introduction to psychological research and applications; psychobiology, perception, learning, motivation, consciousness, cognition, personality and 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)

Introduction to psychological research and applications; psychobiology, perception, learning, motivation, consciousness, cognition, personality and 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 205 Interpersonal Communication (3) (Also listed as SP 205)

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 202.

PSY 302 Behavior in Organizations (3)

Psychological characteristics of functioning organizations and factors in organizing; psychological issues relevant to the maintenance of the organization; motivation, leadership, group phenomena, communication, decisionmaking, and organizational change. 3 lectures. Prerequisite: PSY 201 or 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)

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: 3 units of psychology or 9 units of natural science.

PSY 307 Abnormal Psychology (3)

Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes the psychoneuroses, psychoses, alcohol and drug addiction, psychosomatic illnesses, and character disorders. 3 lectures. Prerequisite: PSY 201 or 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 202 or consent of instructor.

PSY 311 Human Factors and Environmental Psychology (3)

Person-environment interactions including sensory, perceptual and cognitive capabilities and limitations; effects of the physical environment upon individuals and groups, and behavioral effects on the environment. 3 lectures. Prerequisite: PSY 201 or 202.

PSY 320 Behavioral Effects of Drugs and Alcohol (3)

Effects of drugs and alcohol on motivation, emotion, perception, and learning. Organization of research findings into tentative theoretical and treatment models relevant to personal, social, and organizational adjustment. 3 lectures.

PSY 401 Social Psychology (3)

Human behavior as a product of social influence and interaction; conformity, attitudes and attitude change, interpersonal attraction and attributional processes, cooperation, competition, aggression, leadership. 3 lectures. Prerequisite: PSY 201 or 202 or consent of instructor.

PSY 421 Developmental Processes (3) (Also listed as CD 421)

A 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 lectures. Prerequisite: CD 125, 225, 230 and 325, or graduate standing and consent of instructor.

PSY 432 Psychological Testing (3)

Principles and procedures of the selection, the administration, scoring, and the interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: 6 units of psychology.

PSY 446 Assessment of Learning Disabilities (3)

Use of psychological tests and other assessment devices for the diagnosis of learning disabilities and for developing prescriptive teaching. Includes assessment of physical, intellectual, social and emotional characteristics of children. 3 lectures. Prerequisite: PSY 202, 432.

PSY 454 Personality (3)

Personality theories and research; human motivation; description and development of personality characteristics; adaptation and self-actualization. 3 lectures. Prerequisite: 3 units of Psychology.

PSY 455 Learning and Motivation (3)

Principles, major theories, methods and research findings relevant to major experimental areas of learning and motivation. Derivation of principles from research data, current research contributions, and implications for applied problems. 3 lectures. Prerequisite: 3 units of psychology.

438 PSY—REC

PSY 456 Behavioral Disorders in Children (3)

Applications of psychological learning principles to childhood behavioral disorders: aggression, delinquency, stress reactions, emotional-motivational disorders, perceptual-attentional deficiencies, neuroses, psychoses, psychosomatic disorders, biological dysfunctions, and retarded social and cognitive development. 3 lectures. Prerequisite: 3 units of psychology.

PSY 457 Leisure Counseling (3) (Also listed as ED 457 and 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 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 (2)

Introduction to a wide variety of outdoor recreation and leisure pursuits with emphasis upon skill acquisition. 1 lecture, 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, 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. 3 lectures, 1 laboratory. Prerequisite: REC 210 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. Historical, philosophical and theoretical foundations of the recreation and leisure services movement. Emphasis upon the development of a professional philosophy. 3 lectures. Prerequisite: REC 101, 105, 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 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 laboratory. Prerequisite: REC 210 or consent of instructor.

REC 369 Research in Recreation Administration (3)

Research design, questionnaire and interview schedule construction, sampling, methods, data array and analysis. Selection and preliminary investigation, under faculty supervision, of senior project topic. 2 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

REC 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 curriculum coordinator.

REC 424 Management of Recreation and Leisure Services (3)

Principles, practices and procedures in recreation administration; emphasis on budgeting, areas and facilities management, 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 324, senior standing, approval of curriculum coordinator.

REC 432 Honors 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, 3.0 GPA overall, approval of curriculum coordinator.

REC 457 Leisure Counseling (3) (Also listed as ED 457 and 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 Senior Project (3)

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 60 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.

440 REC—SOC

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)

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)

An appraisal of various factors from which social problems of the contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.

SOC 201, 202, 203 Principles of Sociology (3) (3) (3)

Sources of materials and methods of sociological study; concepts and principles; structure and process of group life; social institutions. Applications of techniques in field study. 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 The 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: 9 hours of 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.

SOC 305 Sociology of Social Movements (3)

An 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)

The course focuses on the causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events will be the main object of study, 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 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 is 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: 3 units of SOC 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)

Structure of relationships among ethnic and racial groups. Source of discrimination and prejudice in personality and social structure. Patterns of segregation. Evaluation of current techniques for restructuring intergroup relations. 3 lectures. Prerequisite: ETHS 114; 6 hours of sociology or consent of instructor.

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: Six units of 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: 6 hours of 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: 6 units of Sociology.

SOC 333 Social Research Methods (3)

Research design, development of scales, uses of computers, questionnaire construction and interview techniques, sampling methods and analysis of data. 3 lectures. Prerequisite: One sociology course and STAT 211; or consent of instructor.

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: College 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)

Study and analysis of the organization and operation of modern medicine emphasizing the interplay of several roles in medical practice. Stress given to the 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.

442 SOC—SOC

SOC 379 Work and Leisure (3)

Sociological analysis of these significant dimensions of everyday life. Special attention to the world of work and its several functions. Exploration of the interplay between patterns of work and leisure. 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: Two courses in sociology or consent of instructor.

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 lectures. Prerequisite: SOC 302.

SOC 414 Social Work Practicum (3)

The 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 413 or equivalent, or consent of instructor.

SOC 421 Social Theory (3)

Analysis of the nature and types of classical and contemporary sociological and anthropological theory. 3 lectures. Prerequisite: SOC 203.

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.

SOC—SOCIAL SCIENCES

SOC 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.

SOC 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.

SOC 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 (2)

Intensive study of selected social problems with application of techniques for analysis. 2 meetings. Prerequisite: Senior standing or consent of instructor.

SP—SPEECH**SP 111 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.

SP 200 Principles of Speech (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. 3 lectures.

SP 201 Public Speaking (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 SP 200.) 3 lectures.

SP 205 Interpersonal Communication (3) (Also listed as PSY 205)

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.

SP 206 Voice and Articulation (3)

Physiology of normal speech; assessment and improvement of students' vocal and articulation practices to enhance oral skills. 3 lectures.

SP 215 Argumentation (3)

Analysis of inductive and deductive reasoning and evidence in persuasive discourse. Practice in the construction and criticism of oral and written argumentation. 3 lectures.

SP 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.

SP 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.

SP 301 Debate (4)

Techniques of argumentation and their application to debate; logic and reasoning; fallacies of reasoning; experience in various forms of formal argument, including intercollegiate debate; judging and debate program administration. 4 lectures. Prerequisite: SP 200.

SP 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.

SP 304 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: SP 200 or 201.

SP 305 Oral Interpretation (4)

Basic theory of interpretation; selection, preparation, and presentation of material for oral reading. 4 lectures.

SP 306 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.

SP 308 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: SP 200, or consent of instructor.

SP 310 Oral Interpretation of Children's Literature (3)

Techniques of oral interpretation; selection, preparation, and presentation of literature, K-6. Problems unique to story reading and telling, poetry and prose, choral reading and group performance. 3 lectures.

SP 311 Cross-Cultural Communication (3)

Examination and clarification of communication problems within and between ethnic groups. 3 lectures.

SP 313 The 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: SP 302, 306.

SP 314 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 202, SP 205, consent of instructor.

SP 317 Rhetoric: Classical Period to Renaissance (4)

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; the medieval contributions of Augustine, Boethius and Martianus Capella. 4 lectures.

SP 318 Rhetoric: Renaissance to the Present (4)

Development of rhetorical theory in the Renaissance period through contemporary concepts of rhetoric; contributions of Ramus, Cox, Wilson, Bacon, Sheridan, Walker, Campbell, Whately, Blair, and Adams; contemporary theories of Burke, Weaver, Richards, Toulmin and Perelman. 4 lectures. Prerequisite: Consent of instructor.

SP 319 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: SP 304 or 317 or consent of instructor.

SP 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: SP 250.

SP 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.

SP 403 Organizational Communication (3)

Relationships of human behavioral dynamics within the organizational process. Functions of information networks in organizations. The role of leadership in the business-industrial context. 3 lectures. Prerequisite: Junior standing.

SP 405 Advanced Oral Interpretation (3)

Choral reading, readers theater, and special projects. 3 lectures. Prerequisite: SP 305, or consent of instructor.

SP 406 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.

SP 408 American Public Address (4)

Historical survey to 1865; evaluation of great speakers and speeches as they pertain to the development of American institutions. 4 lectures. Prerequisite: SP 304, or consent of instructor.

SP 409 American Public Address (4)

Historical survey from 1865 to present; evaluation of great speakers and speeches as they pertain to the development of American institutions. 4 lectures. Prerequisite: SP 304, or consent of instructor.

SP 411 Communication Research (4)

Communication research strategy methodology. Basic methods of designing research in empirical and nonempirical communication studies. 4 lectures. Prerequisite: STAT 211, SP 314.

SP 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 60 hours total time.

SP 463 Undergraduate Seminar (2)

Discussion of individual projects, oral reports on material in current professional writings. 2 lectures. Prerequisite: Senior standing.

SP 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.

446 SP—SPAN

SP 512 Psycholinguistic Disabilities (3)

Causes, identification, evaluation, and treatment of various types of language disorders. Oral language, reading, and writing disabilities. Organic, environmental, and emotional factors. 3 lectures. Prerequisite: SP 302, 313.

SPAN—SPANISH

SPAN 101, 102, 103 Elementary Spanish (5) (5) (5)

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 5 lectures.

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)

Course is designed to help the student acquire correct Spanish pronunciation by eliminating English sounds. 2 lectures. Prerequisite: SPAN 103 or equivalent.

SPAN 201, 202, 203 Intermediate Spanish (3) (3) (3)

Review of Spanish grammar and practice in writing and oral expression based on social and cultural values. Sequence courses. Prerequisite: SPAN 103 or consent of instructor. Simultaneous enrollment in SPAN 221, 222, 223 is recommended. 3 lectures.

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, 223, or equivalent or consent of instructor.

SPAN 305 Significant Writers in Spanish (4)

Study in depth of 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 their linguistic and semantic differences. Essay techniques and translation practice. Vocabulary building, spelling and 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 Techniques of Translation (4)

Practice in translating from English to correct Spanish and vice versa, eliminating unacceptable vocabulary, syntax and idiom influence from translated language. 3 lectures, 1 activity. Prerequisite: SPAN 301.

SPAN 405 Spanish Literature in English Translation (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 Spanish writers. Lecture in English. Class schedule will list topics selected. Total credit limited to 6 units. 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.

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)

Physical, chemical, and biological properties of soils as related to agriculture. 3 lectures, 1 laboratory.

SS 122 Soil Management (4)

Effect of tillage, manuring, drainage, and irrigation practices on soil productivity. 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. 3 lectures. Prerequisite: SS 121 or consent of instructor.

SS 221 Fertilizers (4)

Composition, value, and use of fertilizer materials and soil correctives. Methods employed in the manufacture, distribution, and application of fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

SS 223 Soil Materials (4)

Origin, composition, and identification of rocks, minerals, and other materials 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 128.

SS 321 Soil Classification (4)

Field study of morphological characteristics of local soils. Implementation of concepts used in soil taxonomy. Interpretation of soil suitabilities for agronomic and urban uses. 2 lectures, 2 laboratories. Prerequisite: SS 122, 223.

SS 322 Soil Fertility (3)

Plant nutrient requirements of crops. Effect of soil and climatic conditions on the availability of nutrients in the soil. Diagnostic techniques in soils and crops. 2 lectures, 1 laboratory. Prerequisite: SS 122, 221, CHEM 122 or 128.

SS 332 Conservation Techniques for Site Development (3)

Methods and techniques for conservation of soils and dispersal of excess water on urban, industrial, recreation and dwelling sites. 2 lectures, 1 laboratory.

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 414 Soil, Plant and Water Analysis (4)

Quantitative instrumental and laboratory techniques for establishing nutrient status of soils and element content of plants and water as related to crop production. 3 lectures, 1 laboratory. Prerequisite: SS 322, CHEM 129 or consent of instructor.

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 the holding of 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 122, 221, BACT 221, CHEM 328 or consent of instructor.

SS 423 Soil Chemistry (4)

Fundamental concepts and practices in soil chemistry. Methods of analysis and interpretation of significant investigations for the management of soils. 3 lectures. 1 laboratory. Prerequisite: SS 322, CHEM 129 or consent of instructor.

SS 431 Soil Taxonomy (2)

The 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, 321.

SS 432 Soil Physics (4)

Advanced study of the physical properties of soils. Application of physical-chemical soil relationships to farming and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 122, PHYS 104, 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, 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.

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 lectures.

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)

Advanced study of the morphological characteristics and genesis of soils and their relationship with major landform features. New techniques used in modern systems of soil classification and mapping. 2 lectures, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

SS 581 Graduate Seminar in Soils (3)

A review of current research, experiments and problems related to soil science. Development of special demonstration and field plot trials for educational groups. 3 lectures.

SS 582 Graduate Seminar in Land Management (3)

Development of plans and practices for the management of crop, range, and wood land. 2 lectures, 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)

Classification of statistical data; calculation and uses of various averages; measures of variability; elementary probability; binomial and normal distributions; random sampling, confidence limits, introduction to hypothesis testing. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

STAT 212 Statistical Methods (3)

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)

Descriptive statistics. Review of probability distributions. Pt. 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, CSC 120.

STAT 252 Statistical Inference for Management II (3)

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.

STAT 313 Analysis of Variance (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.

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STAT 321, 322, 323 Statistical Analysis (3) (3) (3)

Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation, 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 142.

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 non-linear regression models. 3 lectures. Prerequisite: STAT 212 or 252 or 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, CSC 101.

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 322.

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 211 or 321.

STAT 423 Design of Experiments (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.

STAT 425 Probability Theory and Applications I (3)

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 activity periods.

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 lectures. Prerequisite: Intermediate algebra or equivalent.

STAT 527 Theory and Applications of Statistics (3)

Discrete and continuous random variables, expected values and moments, moment generating functions, multivariate distributions, sampling, sampling distributions, interval estimation, test of hypotheses. 3 lectures. Prerequisite: STAT 321.

STAT 528 Theory and Applications of Statistics (3)

Multivariate normal distribution, sampling distributions, interval estimation, tests of hypotheses, regression and linear hypotheses, experimental design models, and nonparametric methods. 3 lectures. Prerequisite: STAT 527.

TH—THEATRE**TH 220 Introduction of Theatre (3)**

The 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 Theatrical History and Literature (3) (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 Scenery and Lighting Design (3)

Stage scenery and lighting design from the study of the script through the rendering of elevations and the construction and lighting of models. Light and color as used in scenery design. 3 lectures. Prerequisite: TH 220.

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)**

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. A field trip to a major California vegetable production area is 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, Packaging and Marketing Vegetable Crops (4)

Harvesting methods and procedures; current handling and packaging techniques; containers; storage; and grades, grading and laboratory tests for fresh market vegetables. A field trip to a major California vegetable production, processing or marketing area is required. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

VGSC 326 Advanced Vegetable Production (4)

Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. A field trip to a major California vegetable production area is required. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

VGSC 424 Vegetable Crop Management (4)

Organization, management, and operation of commercial size vegetable production acreages; advanced work in production, harvesting, marketing operations, and the varied aspects of the entire commercial vegetable production industry. A field trip to a major California vegetable production area is required. 3 lectures, 1 laboratory. Prerequisite: VGSC 326.

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 206 Laboratory Animal Care (3)

Applied principles involving care and management of laboratory farm animals, veterinary principles involving the care of animals with injury and disease. 3 lectures. Prerequisite: VS 123.

VS 243 Animal Parasitology Laboratory (2)

Identification of common external and internal parasites of livestock and laboratory animals. Sampling and laboratory techniques relative to collection, identification and fixation of parasite specimens. 2 laboratories. Prerequisite: ZOO 131, VS 203 (may be taken concurrently).

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)

A study of 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: Prior consent of department head.

VS 432 Animal Pathology (2)

Gross and microscopic study of the pathology of animals and animal tissue. Emphasis will be on meat, milk, laboratory and wild animals. Course will explore the basics of pathological processes and their importance in management, economics and public health. 1 lecture, 1 laboratory. Prerequisite: VS 123, 203, 302.

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.

VS 522 Seminar in Disease Problems (2)

Livestock disease problems related to national and international animal health. Familiarization with governmental prevention, control, and eradication programs. State and federal regulations relating to importation and exportation of livestock. 2 lectures. Prerequisite: VS 302.

ZOO—ZOOLOGY**ZOO 131 General Zoology (4)**

Cells, tissues, and organ systems of vertebrates; emphasis on man and domestic animals. 2 lectures, 2 laboratories.

ZOO 132 General Zoology (4)

Embryology, genetics, taxonomy, economic zoology, ecology and evolution. 2 lectures, 2 laboratories. Prerequisite: ZOO 131.

ZOO 133 General Zoology (4)

The variety, structure and distribution of invertebrate animals. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 237 Human Anatomy (3)

Morphology of man 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.

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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)

The 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)

Study of the developmental anatomy of selected stages of the frog, chick 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)

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)

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)

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)

Comparative structure of vertebrate organ systems. 3 lectures, 2 laboratories. Prerequisite: ZOO 132.

ZOO 329 Vertebrate Field Zoology (4)

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)

Study of 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)

Study of the muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite: ZOO 237 (may be taken concurrently).

ZOO 341 Herpetology (4)

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. Recommended: ZOO 237 or 326.

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)

Microscopic and chemical examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: 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. Course will include 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. Prerequisites: ZOO 132 and BIO 431.

ZOO 437 Animal Behavior (4)

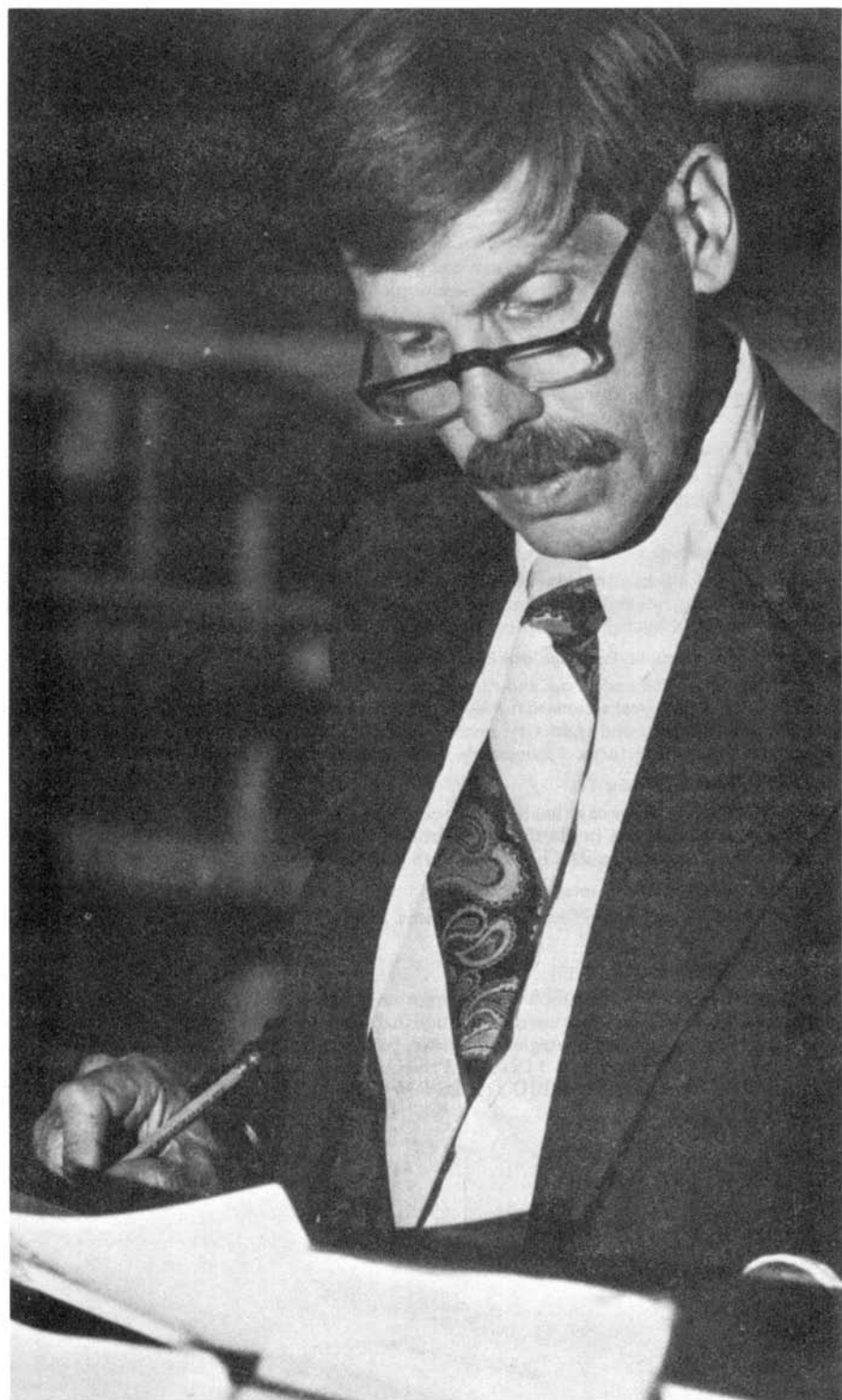
Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 (BIO 315 and 325 recommended).

ZOO 524 Functional Vertebrate Morphology (3)

Analysis of locomotor and feeding mechanisms. 2 lectures, 1 laboratory. Prerequisite: Graduate standing.

ZOO 530 Behavioral Ecology (3)

An intensive study of the function and evolution of behavioral phenomena as they relate to ecological phenomena. Topics covered include: habitat selection; spacing mechanisms; reproductive strategies; feeding strategies; agonistic, parasitic, and altruistic behavior; migration; and comparative social systems. 3 lectures. Prerequisites: Graduate standing, BIO 325 or BOT 326, ZOO 437. Recommended: BIO 315, PSY 304.



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CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO

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BUSINESS AFFAIRS

Director, Business Affairs	James R. Landreth
Administrative Assistant	
Financial Manager	Anthony B. Flores
Director, Plant Operations	Edward M. Naretto
Director, Public Safety	Richard C. Brug
Housing Manager	Raymond Baker
Procurement and Support Services Officer	Ray Macias

FOUNDATION

Executive Director	Alfred W. Amaral
Administrative Assistant	Robert E. Griffin
Controller	James A. Neal

ASSOCIATED STUDENTS, INC.

Director, A.S.I. Business Affairs	Roy Gersten
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DEPARTMENT HEADS

SCHOOL OF AGRICULTURE AND NATURAL RESOURCES

Agricultural Education	Larry P. Rathbun
Agricultural Engineering	Jack D. Wilson
Agricultural Management	M. LeRoy Davis (Acting)
Animal and Veterinary Science.....	Richard F. Johnson
Crop Science	Corwin M. Johnson
Dairy Science.....	Eugene E. Starkey
Food Science	Robert D. Vance
Natural Resources Management	Robert F. Wambach
Ornamental Horticulture	Ronald D. Regan
Poultry.....	Robert A. Voitle
Soil Science.....	C. Dean Piper

SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

Architectural Engineering	David S. Hatcher
Architecture	Raymond W. H. Yeh
City and Regional Planning	William A. Howard
Construction.....	James A. Rodger (Acting)
Landscape Architecture.....	Gerald L. Smith

SCHOOL OF BUSINESS

Accounting	Charles T. Andrews
Business Administration	Walter W. Perlick
Economics	George M. Eastham
Management	Robert H. McIntire

SCHOOL OF COMMUNICATIVE ARTS AND HUMANITIES

Art	Thomas V. Johnston
English	Robert F. McDonnell
Foreign Languages	Verlan H. Stahl
Graphic Communications	Guy H. Thomas, Jr. (Acting)
History	Robert E. Burton
Journalism	Randall L. Murray
Music	Bessie R. Swanson
Philosophy	Kendrick W. Walker
Political Science	Earl D. Huff
Social Sciences	Robert L. Hoover
Speech Communication	Harry W. Sharp, Jr.

SCHOOL OF ENGINEERING AND TECHNOLOGY

Aeronautical and Mechanical Engineering	Raymond G. Gordon
Civil Engineering	Peter Y. Lee
Electronic and Electrical Engineering	Michael M. Cirovic (Acting)
Engineering Technology	William R. Backer (Acting)
Environmental Engineering	Walter E. Holtz
Industrial Engineering	Donald E. Morgan
Industrial Technology	Laurence F. Talbott
Metallurgical and Welding Engineering	Richard C. Wiley

SCHOOL OF HUMAN DEVELOPMENT AND EDUCATION

Child Development and Home Economics	Frances Parker
Education	John B. Connely (Acting)
Ethnic Studies, Coordinator	David J. Sanchez
Liberal Studies, Coordinator	Margaret J. Glaser (Acting)
Physical Education	Jimmy H. Railey
Psychology	L. Robert Sorensen

SCHOOL OF SCIENCE AND MATHEMATICS

Biological Sciences	John K. Hampton, Jr.
Chemistry	William C. Rife
Computer Science and Statistics	Emile E. Attala
Mathematics	Charles J. Hanks
Military Science	Lt. Col. Joseph W. Stewart
Physics	Robert H. Frost

LIBRARY

Assistant Director	Charles R. Beymer
Assistant Director	Angelina Martinez

INTERCOLLEGIATE ATHLETICS

Director	
Associate Director, Men	Richard Heaton
Associate Director, Women	Evelyn I. Pellaton

FACULTY EMÉRITI

(Dates indicate period of service)

Robert E. Kennedy (1940-1979)	President Emeritus
* * * * *	
John K. Allen (1952-1970)	Veterinary Science
Olive M. Andersen (1957-1972)	Mathematics
Elizabeth B. Anderson (1958-1980)	English
Roy E. Anderson (1949-1978)	Business
Warren R. Anderson (1946-1979)	Electronic and Electrical Engineering
John H. Applegarth (1952-1972)	Biological Sciences
William W. Armentrout (1953-1980)	Education
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
J. Philip Bromley (1947-1973)	Agricultural Management
Marvin D. Brown (1956-1963, 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, 1968-1980)	Speech Communication
Ralph C. Collins (1955-1974)	Education
Spelman B. Collins (1940-1968)	Animal Husbandry
David W. Cook (1941-1977)	Mathematics, Academic Affairs
A. Norman Cruikshanks (1947-1971)	Social Sciences
James T. Culbertson (1953-1977)	Philosophy
Bruce A. Dickson (1952-1978)	Soil Science
Ralph W. Dilts (1944-1973)	History
Wesley T. Dunn (1959-1974)	Graphic Communications
Charles A. Elston (1947-1973)	Mathematics
Oswald J. Falkenstern (1953-1977)	Mathematics
Harry C. Finch (1962-1980)	Biological Sciences
Millard J. Fotter (1954-1976)	Industrial Engineering
Clara B. Froggatt (1964-1980)	Counseling
George S. Furmisky (1955-1973)	Engineering Technology
Vincent J. Gates (1958-1977)	Journalism
Curtis F. Gerald (1964-1980)	Computer Science and Statistics

J. Cordner Gibson (1949–1976)	Agricultural Education, Dean of Agriculture and Natural Resources
Marcus Gold (1947–1952) (1954–1980)	Audiovisual
David M. Grant (1950–1980)	English, Academic Affairs
C. Herold Gregory (1950–1970)	Printing Technology and Management
Lester W. Gustafson (1947–1971)	Aeronautical Engineering
Richard E. Hall (1946–1977)	Engineering Technology
John R. Healey (1947–1980)	Journalism
Anatol Helman (1957–1974)	Architecture
Harold J. Hendricks (1952–1978)	Electronic and Electrical Engineering
Charles A. Herald (1958–1975)	Electronic and Electrical Engineering
George E. Hoffman (1956–1979)	Industrial Engineering
Wilbur C. Hogan (1959–1973)	Philosophy
Ray J. Holt (1955–1978)	Physics
Gilbert L. Homfield (1960–1976)	Mathematics
A. L. Houk (1946–1972)	Chemistry
LeRoy B. Hughes (1950–1971)	Physical Education
James J. Jensen (1948–1973)	Physical Education
Mead R. Johnson (1956–1980)	English
Robert M. Johnston (1946–1954) (1956–1974)	Engineering Technology
Edward J. Jorgensen (1947–1976)	Physical Education
Erna Bowman Knapp (1962–1977)	Art
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, School of Science and Mathematics
Charles H. Lindamood (1958–1979)	English
Bernice B. Loughran (1958–1980)	Art
John H. Manning (1956–1975)	Mathematics
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
Robert A. Mott (1946–1978)	Physical Education
Billy W. Mounts (1956–1977)	Physician and Surgeon, Health Center
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
Philip H. Overmeyer (1958–1972)	Business Administration
Willard M. Pederson (1961–1977)	English
James M. Peters (1958–1980)	Chemistry
Clifford J. Price (1956–1974)	Aeronautical Engineering
John B. Rapp (1959–1979)	Mechanical Engineering
Evelyn D. Reagan (1946–1948, 1954–1977)	Library
Oscar E. Reece (1956–1973)	Crop Science
R. Howell Reece (1946–1964)	Mechanical Engineering

R. Wallace Reynolds (1953-1979)	Engineering Technology
Glenn W. Rich (1953-1979)	Agricultural Engineering
Carlos C. Richards (1946-1971)	Engineering Technology
Torleif M. Rickansrud (1944-1969)	Physics
Eugene A. Rittenhouse (1949-1976)	Economics, Placement
Leo E. Rogers (1954-1978)	Engineering Technology
Leo E. Sankoff (1942, 1946-1980)	Agricultural Education
Harry H. Scales (1958-1976)	Education
Walter P. Schroeder (1957-1980)	Education
Chester H. Scott (1952-1978)	Mathematics
Glenn E. Seeber (1954-1979)	Engineering Technology
Vard M. Shepard (1932-1960)	Animal Husbandry, Dean of Agriculture
Orien W. Simmons (1961-1980)	Metallurgical and Welding Engineering
M. Eugene Smith (1946-1974)	History
Warren T. Smith (1952-1973)	Dean of Agriculture
Fred H. Steuck (1947-1978)	Electronic and Electrical Engineering
Ellen T. Stookey (1961-1978)	Home Economics
L. Harry Strauss (1961-1976)	Library
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
William R. Troutner (1942-1976)	Crop Science
Pearl Turner (1951-1974)	Library
Ralph M. Vorhies (1946-1980)	Crop Science
Evelyn K. Voros (1955-1974)	Speech
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
Irwin A. Willson (1958-1975)	Education
Harold O. Wilson (1936, 1946-1974)	Administrative Vice President
C. Paul Winner (1940-1971)	Agricultural Mechanics
Arthur D. Wirshup (1952-1977)	Mathematics
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

STAFF EMERITI

(Dates indicate period of service)

Vic Allen (1951-1976)	Business Affairs
Robert H. Baldrige (1964-1980)	Theatre
Fern Ballard (1954-1974)	Foundation
Joe C. Baze (1962-1980)	Business Affairs
James P. Becker (1962-1980)	Business Affairs
Jack Bertram (1952-1972)	Foundation
Dorothy M. Bishop (1962-1980)	Human Development and Education
Doris Bodine (1961-1978)	Foundation

Leona M. Boerman (1944-1967)	President's Office
Harold A. Burnett (1962-1977)	Agriculture and Natural Resources
William K. Butts (1965-1980)	Business Affairs
Cyrus E. Casady (1950-1974)	Business Affairs
George W. Cockriel (1957-1977)	Business Affairs
Loretta I. Costen (1953-1976)	Engineering and Technology
Donald J. Curtis (1960-1976)	Student Affairs
Roy E. Darr (1953-1971)	Business Affairs
Elizabeth D. Dickens (1961-1980)	Architecture and Environmental Design
Lloyd G. Dietrich (1953-1973)	Business Affairs
Paul S. Dillon (1947-1971)	Foundation
Colier Duncan (1955-1977)	Business Affairs
John Dyer (1963-1979)	Business Affairs
Merriam J. Erickson (1962-1980)	Business Affairs
Lloyd R. Evans (1959-1978)	Business Affairs
Mary Eyler (1961-1980)	Student Affairs
Patricia A. (Eilers) Farrow (1957-1972)	Student Affairs
Bernard J. Fitzgerald (1958-1980)	Business Affairs
Juanita A. Fredericks (1954-1974)	Foundation
Lena Gianolini (1949-1972)	Business Affairs
Gertrude Gladin (1957-1972)	Student Affairs
Marcus Gold (1947-52) (1954-1980)	Audiovisual
Ruth Gran (1957-1975)	Student Affairs
Margaret Green (1960-1977)	Foundation
Mary Lee Green (1948-1976)	Foundation
Joseph C. Hampl (1943-1971)	Foundation
Francine Hapgood (1951-1976)	Business Affairs
Raymond T. Hesse (1948-1972)	Business Affairs
Lillian R. Hooks (1964-1980)	Library
Clara Huffman (1959-1974)	Foundation
Viola E. Hughes (1956-1978)	Student Affairs
Hazel L. Hunter (1965-1980)	Student Affairs
Marie (Williams) Janolis (1962-1977)	Engineering and Technology
Mary Johnson (1950-1976)	Administrative Affairs
Tommie L. Jones (1964-1980)	Business Affairs
Edwin Koch (1961-1976)	Foundation
George Lancaster (1962-1979)	Business Affairs
Lois L. Larson (1962-1978)	Student Affairs
John Lee (1960-1975)	Foundation
Ervin A. Lembcke (1962-1980)	Business Affairs
Joe A. Lipe (1965-1980)	Business Affairs
Ruth Lundquist (1960-1979)	Business Affairs
Josephine E. Maddalena (1965-1980)	Human Development and Education
James Mapes (1961-1977)	Business Affairs
Lionel Middlecamp (1942-1976)	Agriculture and Natural Resources
Robert J. Miller (1960-1980)	Business Affairs
Valdora Myers (1960-1978)	Student Affairs
Harold A. Nash (1947-1974)	Business Affairs
Margaret Nelson (1959-1977)	Student Affairs
Avice I. Nolan (1960-1980)	Audiovisual
Edward L. Nolan (1953-1979)	Mechanical Engineering
Lee Owen (1946-1978)	Business Affairs
Alfred J. Pelucca (1956-1971)	Business Affairs

Charles O. Penwell (1946-1971)	Foundation
Rubin Rutschke (1959-1977)	Business Affairs
Al Sanders (1964-1979)	Business Affairs
Lucy Schmidt (1956-1972)	Business Affairs
Ralph Schurtz (1949-1973)	Business Affairs
F. Yvonne Southgate (1963-1980)	Engineering and Technology
Jean Steck (1960-1975)	Engineering and Technology
Marcie Steger (1962-1979)	Foundation
Arthur A. Thorn (1962-1979)	Business Affairs
Merlin Ward (1946-1974)	Business Affairs
Boyd Wettlaufer (1960-1976)	Audiovisual
Alfred Wilcox (1960-1975)	Business Affairs
Margaret Wilmot (1952-1979)	Library
Frank H. Wyman (1956-1972)	Business Affairs

FACULTY AND STAFF

(Number in parentheses indicates year of appointment)

Listed as of May, 1981

- ABITIA, FRED (1969) Director, Cooperative Education
B.A., San Jose State College, 1964; M.A., 1966; Ed.D., Washington State University, 1971.
Professor.
- ABSHIRE, FRANKLIN P. (1977) Engineering Technology
B.S., Arizona State University, 1969; M.S., 1974. Associate Professor.
- ACORD, DORIS (PAT), (1980) Physical Education
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) 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) Program Manager, Associated Students, Inc.
B.S., Southern Illinois University, Edwardsville, 1969; M.S., Kansas State University, 1973.
- ADAMSON, ROBERT W. (1953) Aeronautical and Mechanical Engineering
B.S., Ch.E., Tulane University, 1941; M.S., Ch.E., Oregon State College, 1948. Professor.
- 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. (1970) Acting Director, Counseling and Testing
B.A., University of Florida, 1964; M.Ed., 1965; Ph.D., Missouri University, 1970.
- AKL, FATHY A. (1979) Civil Engineering
B.S., Cairo University, Egypt, 1968; Post-Graduate Diploma with Distinction, International Courses in Hydraulic Engineering, Delft, The Netherlands, 1972; M.S., University of Calgary, Canada, 1974; Ph.D., 1979. Assistant Professor.
- 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.
- ALMERO, DANIEL A., CPT (1980) Military Science
B.S., Oregon State University, 1973; Infantry Officer Basic, Airborne, and Ranger courses, 1973; Officer Advanced Course, 1977; Behavioral and Social Sciences Program, University of Chicago, 1980.
- AMANZIO, JOSEPH C. (1971) Architecture
B. Arch., University of Florida, 1967; M. Arch. & Urban Design, Washington University, 1974. Associate Professor.
- AMARAL, ALFRED W. (1967) Executive Director, Foundation
B.S., California State Polytechnic College, 1964; M.B.A., Golden Gate College, 1970.
- AMATO, ANTHONY J. (1955) Ornamental Horticulture
B.S., California State Polytechnic College, 1949; graduate study, California Polytechnic State University. Professor.

- 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, MARSHALL L. (1975) Civil Engineering
B.S., University of Minnesota, 1943; M.S., 1949; Ph.D. University of Wisconsin, 1972. Professor.
- ANDERSON, PATRICIA J. (1978) Registered Nurse
R.N., St. Mary's School of Nursing, Illinois.
- ANDERSON, RICHARD A. (1947) Physical Education
B.S., University of Southern California, 1942; M.S., 1947; additional graduate study, University of California, Los Angeles. Professor.
- ANDERSON, RUSSELL K. (1955) Animal Science
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956. Professor.
- ANDOLI, FREDERICK P. (1968) Biological Sciences
B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Associate Professor.
- ANDRE, BARBARA R. (1973) Associate Director, Housing
B.A., Humboldt State University, 1969; M.A., California Polytechnic State University, 1971.
- ANDREINI, ROBERT L. (1954) Speech Communication
B.A., Stanford University, 1941; M.A., 1949; additional graduate study, University of California, Berkeley, Teachers College, Columbia University. Professor.
- 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.
- ANDRESEN, JAMES G. (1956) Aeronautical and Mechanical Engineering
B.S., California State Polytechnic College, 1956, M. Engr., 1979. Assistant Professor.
- ANDREWS, CHARLES T. (1972) Head, Accounting Department
B.S., Eastern Illinois University, 1960; M.B.A., Bowling Green State University, 1963; D.B.A., Indiana University, 1968. Professor.
- ANDREWS, DALE W. (1950) Executive Vice President
B.S., University of California, Davis, 1941; M.A., California State Polytechnic College, 1952; Ph.D., University of Minnesota, 1957.
- 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) Director, CM/P and VEP
B.A., University of Texas at El Paso, 1963; M.S., University of Southern California, 1979.
- ARMSTRONG, GENE A. (1970) Animal Science
B.S., California Polytechnic State University, 1972. Associate Professor.
- ARNOLD, SHARON H. (1977) Library
B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.
- ASBURY, ROBERT F., JR. (1964) Architecture
B.S., University of Kansas, 1954; M. Arch., 1961; M.Ed., University of Hawaii, 1973. Professor.
- 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., (second professional degree) Washington University, 1965; M. Arch./Urban Design, University of Colorado, 1973. Associate Professor.

- ATTALA, EMILE E. (1970)..... Head, Computer Science and Statistics Department
B.S., Cairo University, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D.,
University of California, Santa Barbara, 1974. Professor.
- ATWOOD, LINDA (1974) Chemistry
B.A., Bard College, 1968; M.A., Wesleyan University, 1973; Ph.D., 1974. Associate Professor.
- AUSSEKER, MELVIN W. (1980) Management
B.S., University of California, Berkeley, 1968; M.B.A., 1969; Ph.D., 1974. Associate Professor.
- AVEY, RENNY J. (1973) Agricultural Management
B.S., California Polytechnic State University, 1969; M.S., Oregon State University, 1972;
Ph.D., University of Hawaii, 1974. Associate Professor.
- BABB, JAMES H. (1959) Graphic Communications
Printing Industry, owner, Visalia Printing Service. Assistant Professor.
- BABB, W. J. (BUD) (1977) Counselor
B.A., Drew University, 1959; M.A., Lehigh University, 1963; Ph.D., University of Oregon,
1974.
- 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., Oregon College of Education, 1952; M.Ed., 1960, M.S., 1964; Ph.D., University of
Oregon, 1968. Associate Professor.
- BACKER, WILLIAM R. (1977) Acting Head, Engineering Technology Department
B.M.E., Rensselaer Polytechnic Institute, 1949; M.S., Massachusetts Institute of Technology,
1950. Associate Professor.
- BAGNALL, JAMES R. (1969) Architecture
B.A., Occidental College, 1957; M. Arch., University of California, Berkeley, 1974. Associate
Professor.
- BAILEY, CHRISTINA ANN (1978) Chemistry
B.S., College of Saint Elizabeth, Convent Station, New Jersey, 1964; Ph.D., Purdue Univer-
sity, 1970; M.A., California Polytechnic State University, 1971. Assistant Professor.
- BAILEY, PHILIP S. (1969) Associate Dean, School of Science and Mathematics
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor.
- BAILLIE, ALLAN S. (1978) Management
B.S., Ohio University, 1954; M.B.A., University of Washington, 1960; Ph.D., 1978. Associate
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, RAYMOND A. (1966) Housing Manager
B.S., University of Wisconsin, 1955.
- BALL, R. WAYNE (1969) Medical Officer
M.D., University of Missouri School of Medicine, 1961.
- BALLEW, THOMAS J. (1975) Architectural Engineering
B.S., University of Oklahoma, 1954; M.A., Arizona State University, 1972. Associate
Professor.
- BALTHASER, LAWRENCE H. (1969) Physics
B.A., Rutgers University, 1960; M.A., Indiana University, 1963; Ph.D., 1969. 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) Counselor
B.A., California Polytechnic State University, 1966; M.S. 1967.

- BARCLAY, KENNETH B. (1979) Director, Activities Planning Center
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D., Kent State University, 1975.
- 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
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., Arch., University of Cincinnati, 1964; M. Arch., University of Washington, 1970, graduate study, Danish Royal Academy of Arts; George C. Marshall fellowship grant. Professor.
- BAUMGARTEN, GEORGE M. (1969) Architecture
B. Arch., University of Michigan, 1947; M. Arch., University of California, Berkeley, 1976. Associate Professor.
- BAUR, LAWRENCE E., JR. (1965) Accounting
B.B.A., University of Michigan, 1954; M.B.A., 1957. Associate Professor.
- BAYNE, JAY S. (1973) Computer Science and Statistics
B.S.E.E., University of California, Santa Barbara, 1969; M.S., E.E., 1971; Ph.D., 1977. Associate 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.
- BECK, DENNIS L. (1976) Ornamental Horticulture
B.S., University of California, Davis, 1975; M.S., 1976. Assistant Professor.
- BEDWELL, JACK E. (1974) Natural Resources Management
B.S., California State College, Long Beach, 1969; M.S. 1973. Associate Professor.
- BEECHER, LLOYD N. (1969) History
B.A., California State College, Fullerton, 1965; M.A., 1966; Ph.D., University of Georgia, 1970. Professor.
- BEGG, IAN C. (1970) Engineering Technology
B.S.M.E., Witwatersrand University, South Africa, 1941; B.S.E.E., 1946; M.S., University of California, Berkeley, 1970. Professor.
- BENNETT, DARRELL F. (1971) Pharmacist
B.S., University of Arizona, 1965.
- 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) Director, Public Affairs
B.S., New York University, 1961; A.M., University of Missouri, 1962.
- BERTOZZI, DAN, JR. (1974) Business Administration
A.B., University of California, Berkeley, 1966; M.B.A., 1969; J.D., 1971. Associate Professor.
- BETHEL, ARTHUR 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; M.S., Ohio State University, 1971; Ph.D., 1974. Associate Professor.
- BEYMER, CHARLES R. (1966) Assistant Director Library
B.S., University of Wisconsin, 1950; M.L.S., 1955; additional graduate study, University of Wisconsin, University of California, Berkeley. Librarian.

- BIRKETT, RICHARD J. (1955)** Animal Science
B.S., California State Polytechnic College, 1953; M.S., Kansas State University, 1963.
Professor.
- BISHOP, ROGER H. (1973)** Agricultural Management
B.S., California State Polytechnic College, San Luis Obispo, 1965; M.B.A., University of
California, Berkeley, 1970; M.S., University of Southern California, 1979. Assistant
Professor.
- BJORKMAN, DONALD C. (1977)** Art
B.A., University of Washington, 1963; M.F.A., School for American Craftsmen, Rochester
Institute of Technology, 1965. Associate Professor.
- 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.
- BLESSE, ROBERT E. (1977)** Library
B.A., California State University, Chico, 1970; M.A., 1972; M.L.S., University of California,
Los Angeles, 1974. Senior Assistant Librarian.
- BLODGET, ROBERT L. (1974)** Child Development and Home Economics
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. 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)** Coordinator, Disabled Student Services
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.
- 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)** Director, Housing
B.S., California State Polytechnic College, 1956; M.A., 1970.
- BOWKER, LESLIE S. (1974)** Biological Sciences
B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington
State University, 1974. Associate Professor.
- BRADY, MARY L. (1968)** Library
B.A., Mundelein College, 1960; M.A.L.S., Rosary College, 1966; M.A., California Polytechnic
State University, 1978. Associate Librarian.
- BRAUNINGER, ANDREA, M.D. (1974)** Physician
A.B., California State University, San Jose, 1966; M.D., University of Southern California,
1971; Medical Internship, University of Florida, 1972.
- 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 Polytechnic State University, San Luis Obispo, 1970; M.L.A., California
State Polytechnic University, Pomona, 1977; additional graduate study, California Polytech-
nic State University. Assistant Professor.
- BRENNAN, ANDREW (1968)** Coach, Athletics
B.S., University of Southern California, 1958; M.S., 1960.
- BRENNER, PATRICIA A. (1970)** English
B.S., Bob Jones University, 1957; M.A., Middlebury College, 1963; Ph.D., Kent State Uni-
versity, 1970. Professor.

- BRODIE, DAVID A.** (1970) Architecture
B. Arch., University of Capetown, S.Africa, 1953; M. Arch., University of California, Berkeley, 1964. Professor.
- BROWN, HOWARD C.** (1943) Dean, School of Agriculture and Natural Resources
B.S., California State Polytechnic College, 1943; M.S., Ohio State University, 1954; Ph.D., 1963. Professor.
- BROWN, JOHANNA B.** (1969-1973, 1974) Library
B.A., Saint Mary's College, 1966; M.L.S., State University of New York at Geneseo, 1967. Senior Assistant Librarian.
- 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, Ontario, 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) Dean of Students
B.A., Whitworth College, 1958; M.A., University of Nebraska, 1960; Ph.D., 1967.
- BROWN, WILLIAM H.** (1957) Architecture
B. Arch., University of Florida, 1954; M. Arch., 1968; additional graduate study, University of Sydney. Professor.
- BRUCKART, WILLIAM L.** (1969) Industrial Technology
B.S., University of Kentucky, 1942; M.S., Ohio State University, 1953; additional graduate study, Bowdoin College and Massachusetts Institute of Technology. Professor.
- BRUG, RICHARD C.** (1978) Director, Public Safety
A.A., Compton College, 1969; B.A., California State University, Long Beach, 1974.
- BUCCOLA, VICTOR A.** (1962) Physical Education
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.E.E., Illinois Institute of Technology, 1954; M.S.E.E., 1956. Assistant Professor.
- BUFFA, ANTHONY J.** (1970) Physics
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. 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. Associate Professor.
- BURRELL, SHEL A.** (1973) Associate Director, Placement
B.A., University of California, San Diego, 1971; graduate study, California Polytechnic State University, San Luis Obispo.
- 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. Associate Professor.
- 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.
- BURTON, ROBERT E.** (1968) Head, History Department
A.B., San Diego State College, 1962; M.A., University of Oregon, 1964; Ph.D., 1969. Professor.

- BUSSELEN, HARRY J., JR.** (1975) Associate Dean,
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.
- BUTLER, J. KENT** (1977) Industrial Engineering
B.S.E., Arizona State University, 1961; M.S.E., 1963; Ph.D., 1971. Associate 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 studies, University of Paris, Hague Academy
of International Law. Associate Professor.
- BYRNE, DENNIS M.** (1980) Activities Planning Center
B.S. Michigan State University, 1975; M.A. 1976; additional graduate study.
- CAIN, DAVID J.** (1980) Counselor
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.
- CAIRNS, EDWARD A.** (1969) English
B.A., Stanford University, 1956; M.A., San Francisco State University, 1963; Ph.D., Univer-
sity of Denver, 1971. Associate Professor.
- CALI, KAREN L.** (1978) 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. Assistant Librarian.
- CANO, RAUL J.** (1974) Biological Sciences
B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of Montana,
1974. Associate Professor.
- CAREY, CATHRYN GAIL** (1978) Radiologic Technologist
A.R.R.T., C.R.T. Santa Monica Hospital 1961; postgraduate work Cedars Sinai, and Loma
Linda Hospitals.
- CARNEGIE, E. J.** (1963-64) (1965) Agricultural Engineering
B.S., California State Polytechnic College, 1962; M.Engr., University of California, Davis,
1963. Professor.
- CARPENTER, THOMAS W.** (1968) Aeronautical and Mechanical Engineering
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Pro-
fessor.
- CARY, ARTHUR S.** (1974) Physics
B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969.
Associate Professor.
- CENSULLO, ALBERT C.** (1974) Chemistry
B.S., Villanova University, Pennsylvania; Ph.D., Penn State University, 1975. Associate
Professor.
- CHAPMAN, ARTHUR J.** (1972) Architecture
B.S., B. Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State Univer-
sity, 1971; additional graduate study, University of California, Los Angeles. Associate
Professor.
- 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
B.S., Indiana University, 1951; M.S., 1963; additional graduate study Indiana University,
University of Oregon. Professor.
- CHEW, MARIE** (1976) Graduate Nurse
R.N., St. Joseph College, Emmitsburg, Maryland; 1959; B.S., 1959.
- CHILDERS, COLLEEN A.** (1975) Animal Science
B.S., California Polytechnic State University, 1969; M.S. 1976. Assistant Professor.

- CHIPPING, DAVID H. (1971) Physics
B.S., Cambridge University, England, 1965; M.S., Stanford University, 1967; Ph.D., 1970.
Associate 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.E.E., Chinese National Chekiang University, 1947; M.S.E.E., 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. Associate Professor.
- CIANO, DAVID A. (1973) Director of Judicial Affairs
B.A., University of Redlands, 1966; J.D., University of California, Los Angeles, 1972.
- CICHOWSKI, ROBERT S. (1971) Chemistry
B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.
- CIRONE, JOAN M. (1971) Nurse Practitioner
R.N., Cuesta College, 1971; Nurse Practitioner, University of California, Los Angeles, 1974; B.S.N., California State College, Bakersfield, 1979.
- CIROVIC, MICHAEL M. (1968) Acting Head,
Electronic and Electrical Engineering Department
B.E., New York University, 1965; M.S., 1968. Professor.
- CLARK, WILLIAM E. (1977) Environmental Engineering
B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Associate Professor.
- CLAUSE, ODILE M. (1976) Foreign Languages
B.A., University of Wyoming, 1967; M.A., 1968; Ph.D., University of Colorado, 1975. Assistant Professor.
- CLERKIN, EDWARD J. (1964) Electronic and Electrical Engineering
B.S.E.E., Colorado State University, 1950; M.S.E.E., University of Idaho, 1962; additional graduate study, Utah State University, Colorado State University, Oklahoma University. Associate Professor.
- 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.E.E., Montana State University, 1961; Ph.D., University of Colorado, 1975. Professor.
- CLUCAS, GEORGE G. (1956-62) (1968) Political Science
A.B., University of Michigan, 1947; M.P.A., 1949; Ph.D., University of Southern California, 1969. Professor.
- COATS, DONALD M. (1964) Associate Dean, Educational Services
B.S., California State Polytechnic College, 1964; M.A., 1969.
- COCHRAN, BURT JR. (1976) Medical Officer
M.D., University of Southern California Medical School, 1949.
- COCHRANE, MONA (1970) Nurse Practitioner
R.N., Knapp College of Nursing, Santa Barbara, 1953.
- COE, ROBERT K. (1978) Dean, School of Business
B.S., 1957; M.B.A., 1958; Ph.D., Syracuse University, 1963; B.A., California State College, Bakersfield, 1977.
- COLEMAN, EUGENE F. (1972) Graphic Communications
B.S., University of Pittsburgh, 1934; graduate study, University of Pittsburgh, Washington University. Associate 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. Associate Professor.
- COLEMAN, WILLIE M. (1980) Counselor
B.A., San Francisco State, 1966; M.S.W., University of California, Berkeley, 1971.
- COLLINS, THOMAS A. (1973) Medical Officer
B.S., Stanford University, 1935; M.D., Stanford University School of Medicine, 1940; residency, surgery, Highland-Alameda County Hospital, 1941; M.P.H., Harvard School of Public Health, 1955; Diplomate, American Board of Preventive Medicine, 1956.
- COLOME, JAIME S. (1972) Biological Sciences
B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974. Associate Professor.
- COLVIN, MICHAEL R. (1979) Mathematics
B.A., University of Houston, 1968; M.A., 1970; Ph.D., 1976. Assistant Professor.
- CONNELY, JOHN B. (1970) Acting Head, Education Department
B.A., University of Southern California, 1958; Ph.D., 1970. Professor.
- CONNER, E. WESLEY (1963) Ornamental Horticulture
B.S., California State Polytechnic College, 1956; M.Phil. (L. Arch), University of Nottingham, England, 1974. Professor.
- 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.
- COOPER, ALLAN R. (1975) Architecture
B.A. Arch., Rice University, 1967; B. Arch., Rice University, 1968; M. Arch., Cornell University, 1971. Associate Professor.
- COOPER, MARK A. (1978) Engineering Technology
B.S., California Polytechnic State University, 1968; M.S., Arizona State University, 1978; additional graduate study. Assistant Professor.
- COREY, LOUANNA M. (1975) Supervising Nurse
R.N., St. Mary's Hospital School of Nursing, Waterbury, Connecticut, 1942; B.S., California State University, Los Angeles, 1965; M.S., 1975; post graduate education as Pediatric Nurse Practitioner, Los Angeles County Health Department, 1967-68; Pediatric Nurse Practitioner certification by American Academy of Pediatrics, 1977.
- COTA, HAROLD M. (1966) Environmental Engineering
B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor.
- COYES, FRANK G. (1965) Agricultural Engineering
B.S., California State Polytechnic College, 1950; M.A., 1957. Professor.
- CRABB, A. CHARLES (1978) Crop Science
B.S., University of California, Davis, 1973; M.S., Bowling Green State University, 1974. Assistant Professor.
- CRABTREE, H. SANDRA (1979) Child Development and Home Economics
B.S., California Polytechnic State University, 1961; M.S., University of Wisconsin, 1973; Ph.D., Colorado State University, 1979. Associate Professor.

- CRANE, FRANKLIN S. (1958) Engineering Technology, Aeronautical and Mechanical Engineering
B.S., Colorado School of Mines, 1943; graduate study, Massachusetts Institute of Technology. Professor.
- CRIVELLO, JOHN H. (1971) Coach, Athletics
B.S. California State University, San Jose, 1969; M.S., California Polytechnic State University, 1970.
- 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. Associate Professor.
- CULVER, JOHN H. (1975) Political Science
B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Associate Professor.
- CUMMINS, CARL C. (1958) Dean, School of Human Development and Education
A.B., University of California, Santa Barbara, 1948; M.S., University of Southern California, 1952; Ed.D., University of California, 1957.
- 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) 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. Associate Professor.
- DALY, JAMES C. (1972) Computer Science and Statistics
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Associate Professor.
- DAMANN, ALAN S. (1975) Agricultural Education
B.S., California Polytechnic State University, San Luis Obispo, 1968; M.S., 1974. Assistant 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) Registered Nurse
R.N., De Anza College, 1973.
- DAVIDMAN, LEONARD (1977) Education
B.A., Brooklyn College, 1966; M.A., Brooklyn College, 1972; Ph.D., Stanford University, 1976. Assistant 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. Professor.
- DAVIS, CHARLES P. (1958) Civil Engineering
B.S., Rensselaer Polytechnic Institute, 1948. Professor.

- DAVIS, KIM (1979) Engineering Technology
B.E.E.T., Southern Technical Institute, 1978; M.S., Rochester Institute of Technology, 1978;
Assistant Professor.
- DAVIS, M. LeROY (1976) Acting Head, Agricultural Management Department
B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D.,
Colorado State University, 1973. Associate Professor.
- DAVIS, MARJORIE A. (1976) Supervising Senior Clinical Laboratory Technologist
B.S., University of Oklahoma, Norman, 1956; M.T., A.S.C.P., P.H. Microbiologist.
- DEAN, ARNOLD M. (1949) Soil Science
B.S., University of Alberta, Canada, 1943; M.S., 1946; Ph.D., University of Wisconsin, 1949.
Professor.
- DEARING, JAMES C. (1979) Music
B.Music, University of Wisconsin, 1972; M.Music, 1973. Assistant Professor.
- DEASE, CLYDE G. (1970-73) (1975) Physics
B.S., Purdue University, 1961; M.S., University of Michigan, 1962; Ph.D., George Washing-
ton University, 1969. Professor.
- DeJONG, ALVIN A. (1974) Biological Sciences
B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Associate
Professor.
- DeJONG, AUGUST (1976) Coordinator of Special Projects, Counseling
B.A., Hope College, 1952; M.A., Chapman College, 1967; Ed.D., University of Southern
California, 1975.
- DEKLEINE, H. ARTHUR (1974) Mathematics
B.S., Western Michigan University, 1964; M.A., 1965; Ph.D., University of California, River-
side, 1968. Associate Professor.
- DELANY, JAMES E. (1970) Mathematics
A.B., San Diego State College, 1961; Ph.D., Iowa State University, 1966. Associate Professor.
- DeLATOUR, CHRISTOPHER (1978) Physics
B.S., Georgetown University, 1979; M.S., Massachusetts Institute of Technology, 1971;
Ph.D., 1974. Assistant 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.
- 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. Associate Professor.
- DIAZ, JOE V. (1976) Counselor
B.A., University of Arizona, 1970; M.Ed., 1971; Ph.D., 1976.
- DICKERSON, ARTHUR F. (1980) Electronic and Electrical Engineering
B.S., University of Texas, 1946; M.S., University of Southern California, 1980. Assistant
Professor.
- 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 Bar-
bara, 1969. Professor.

- DILLS, CHARLES E. (1963)** Chemistry
B.S., North Dakota State University, 1949; M.S., George Washington University, 1951; Ph.D., Harvard University, 1956; additional graduate study, Columbia University. Professor.
- DINGUS, DELMAR D. (1973)** Soil Science
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Associate Professor.
- DIRKES, LOIS M. (1973)** Counselor
B.S., University of California, Los Angeles; M.S., University of Maryland; Ph.D., 1973. Associate Professor.
- 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)** Nurse Practitioner
R.N., St. Anthony's School of Nursing, Oklahoma City, 1967; A.S., Long Beach City College, 1973; Adult Nurse Practitioner Program, California State University, Los Angeles, 1976; Adult N.P. Certification, 1977.
- 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.
- DRAVES, ALBERT W. (1969)** Construction
B.S.M.E., Purdue University, 1948; B.S.C.E., Rensselaer Polytechnic Institute, 1952; M.B.A., Roosevelt University, 1962; additional graduate study, Arizona State University, University of Michigan. Professor.
- DROLL, CHRISTINE (1979)** Art
B.A., University of Missouri, Kansas City, 1976; M.L.S., University of Missouri, Columbia, 1977. Slide Curator.
- 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.
- 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)** Director, Institutional Research
B.S., Iowa State University, 1947; M.S., 1948; additional graduate study, University of Southern California.
- 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.L.A., Syracuse University, 1967; B.S.L.A., New York State University, 1967; M.A., University of Denver, 1970. Associate Professor.
- EASTHAM, GEORGE M. (1966)** Head, Economics Department
B.A., Chico State College, 1961; M.A., University of California, Santa Barbara, 1965; Ph.D., Claremont Graduate School, 1978. Associate Professor.
- EATOUGH, NORMAN L. (1968)** Chemistry
B.S., Brigham Young University, 1947; B.E.S., 1958; M.S., 1959; M.S.Ch.E., 1960; Ph.D., 1968. Professor.

- EDMISTEN, JOHN W. (1968) Architectural Engineering
B.S., California State Polytechnic College, 1965; M.Engr., University of California, Berkeley, 1967. Associate Professor.
- EGGEN, NORMAN R. (1976) Animal Science
B.S., California State Polytechnic College-Kellogg, 1970; M.S., Texas A&M University, 1974. Assistant Professor.
- EHRENBERG, JAMES R. (1977) Engineering Technology
B.S.M.E., Gonzaga University, 1960; M.S.M.E., Seattle University, 1969. Associate Professor.
- ELLERBROCK, GERALDINE B. (1973) Management
B.S., Ohio State University, 1941; M.S., 1967; Ph.D., 1970. Professor.
- ELLIOTT, WALT (1965) Physics
B.S., McNeese State College of Louisiana, 1954; M.Ed., Northwestern State College of Louisiana, 1957; M.S., 1963; Ph.D., University of Arizona, 1972. Associate Professor.
- 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.
- EQUINOVA, RICHARD M. (1973) Director, Placement
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., 1970.
- ERICSON, JON M. (1970) Dean, School of Communicative Arts and Humanities
B.A., Pacific Lutheran College, 1952; M.A., Stanford University, 1953; Ph.D., 1961.
- ERNATT, EDWARD J. (1958) Education
A.B., Wayne State University, 1946; M.Ed., 1950; Ed.D., University of Michigan, 1956. Professor.
- EVANS, BERNARD B. (1970) Computer Science and Statistics
B.A., Long Beach State College, 1959; M.S., Kansas State University, 1962; Ph.D., Purdue University, 1964. Professor.
- 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.
- 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., Civil Engineering, University of Delaware, 1961; M.S., 1968. Associate Professor.
- FERREIRA, LESLIE S. (1978) Dairy Science
B.S., California Polytechnic State University, 1970; M.S., University of Illinois, 1972; Ph.D., Utah State University, 1980. Associate Professor.

- FIERSTINE, HARRY L. (1966)** Biological Sciences
B.S., Long Beach State College, 1957; M.A., University of California, Los Angeles, 1961; Ph.D., 1965. Professor.
- FINCHUM, WILLIS ARNOLD (1976)** Engineering Technology
B.S., Utah State University, 1949; M.S., 1959; graduate study at Purdue University. Professor.
- 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. Assistant 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. Associate Professor.
- FLANAGAN, JAMES ROBERT (1959)** Animal Science
B.S., California Polytechnic State University, 1959; M.S., 1974. Professor.
- FLOYD, DONALD R. (1974)** Social Sciences
B.A., University of California, Berkeley, 1967; M.A., 1968; Ph.D., 1976. Associate Professor.
- FOLEY, THOMAS A. (1979)** Computer Science and Statistics
B.A., Arizona State University, 1972; M.A. 1974; Ph.D., 1979. Assistant Professor.
- FORGENG, WILLIAM D. (1980)** Metallurgical and Welding Engineering
B.MetE, Cornell University, 1958; Ph.D., Purdue University, 1962. Associate Professor.
- 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. Associate Professor.
- FOUTZ, ALAN L. (1973)** Crop Science
B.S., Colorado State University, 1968; M.S., 1970; Ph.D., University of Arizona, 1973. Associate Professor.
- FOWLER, ANNE C. (1965)** Social Sciences
B.A., Douglass College, 1939; M.A., Vanderbilt University, 1959; Ph.D., Tulane University, 1970. Professor.
- FOX, FRANK W. (1957)** Animal Science
B.S., California State Polytechnic College, 1951; M.A., 1957. Professor.
- FREEMAN, HARRIET JO ANNE (1975)** Industrial Engineering
B.I.E., Georgia Institute of Technology, 1966; M.S., University of Southern California, 1974; Ph.D., Stanford University, 1981. Assistant 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. Associate Professor.
- FRIEDMAN, FRED S. (1975)** Engineering Technology
B.S., University of California, Santa Barbara, 1969; M.S., Loyola University, Los Angeles, 1972. Associate Professor.
- FRIETZSCHE, ARTHUR H. (1965)** English
B.A., University of California, 1944; M.A., 1945; Ph.D., 1949. Professor.
- FROST, ROBERT H. (1953)** Head, Physics Department
A.B., University of California, 1939; M.A., 1945; Ph.D., 1947. Professor.

- GAINES, MERRILL C. (1976) Architecture
B.B.A., University of Wisconsin 1965; M. Arch. 1973. Assistant Professor.
- GALLAGHER, GAIL (1978) Registered Nurse
B.S., California Polytechnic State University, 1970; R.N., Cuesta College, 1972.
- GALLARDO, STEVEN A. (1979) Counselor, Financial Aid
B.A., California State College, Bakersfield, 1978; graduate study California State College, Bakersfield and California Polytechnic State University.
- GAMBLE, LYNNE E. (1976) Library
B.A., University of Texas at Austin, 1968; M.L.S., 1969. Associate Librarian.
- GAMBS, ROGER D. (1974) Biological Sciences
B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Associate Professor.
- GANG, DONNA D. (1967) Nurse Practitioner
R.N., Regina General Hospital, Saskatchewan; additional studies, New Jersey State Institute at Greystone Park.
- GANICK, GREGORY L. (1978) Crop Science
B.S., California Polytechnic State University, 1970; M.S., 1972. Assistant Professor.
- 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. Associate 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. Associate 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.
- 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. Associate Professor.
- GENTHNER, FREDERICK L. (1952) Library
B.A., Ohio Wesleyan, 1940; B.S. in L.S., George Peabody, 1941; A.M.L.S., University of Michigan, 1950. Senior Assistant Librarian.
- GEOHAGEN, LOCKSLEY (1977) Counselor, Educational Opportunity Program
B.A., University of California, Los Angeles, 1970; M.A., California Polytechnic State University, 1976; additional graduate study, University of California, Santa Barbara.
- 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) Executive Dean
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951.
- GERSTEN, ROY (1967) Director, Business Affairs, Associated Students, Inc.,
B.S., Sacramento State College, 1966; graduate study, Sacramento State College.
- GIBSON, MARK D. (1980) Natural Resources Management
B.S., Clemson University, 1972; M.S., 1974; additional graduate study, Oregon State University. Assistant Professor.
- 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.

- GLASER, MARGARET J. (1973)Acting Coordinator, Liberal Studies
and International Programs; Education
B.S., Marquette University, 1953; M.Ed., 1970; Ed.D., University of Arizona, 1973. Associate
Professor.
- GLASS, L. JOE (1970) Agricultural Engineering
B.S., Purdue University, 1962; M.S., Texas A&M University, 1965; Ph.D., 1971. Professor.
- GLASSCO, D. EDWARD (1968) Mathematics
B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D.,
1971. 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.
- GOLDBERG, SAUL (1970) Electronic and Electrical Engineering
B.S., Fairleigh Dickinson University, New Jersey, 1963; M.E., University of Florida, Gaines-
ville, 1964; Ph.D., 1968. Professor.
- GOLDEN, JAMES R. (1966)Industrial Engineering
B.S., U.S. Military Academy, West Point, 1945; M.S., Ohio State University, 1961. Professor.
- GOLDENBERG, STUART (1970) Mathematics
B.S., University of California, Los Angeles, 1965; M.S., University of California, Riverside,
1969; Ph.D., 1970. Professor.
- GONSIEWSKI, MARILYN P. (1978)Library
B.A., LeMoyn College, 1971; M.S.L.S., University of Southern California, 1975. Senior
Assistant Librarian.
- GONZALES, LEONARD A. (1972) Coordinator, School Relations
B.A., University of Maryland, 1966; M.A., Chapman College, 1979; additional graduate
study, United States International University.
- 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) Head, Aeronautical
and Mechanical Engineering Department
B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., Uni-
versity of California, Santa Barbara, 1974. Professor.
- GORDON, ROBERT L. (1967) Ornamental Horticulture
Kent State University, Kent, Ohio; Graduate, American Floral Art School, Chicago, Illinois.
Assistant Professor.
- GOWGANI, GEORGE G. (1970) Crop Science
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1968; M.S., Univer-
sity of Nevada, 1972; Ph.D., 1975. Associate Professor.
- GRADY, DAVID V. (1971) Biological Sciences
A.B., University of California, Los Angeles, 1964; Ph.D., 1974. Associate Professor.
- GRAHAM, DAVID (1972)Administrative Program Specialist, Health Center
X-Ray Technologist School, Gunter Air Force Base, 1964; B.A., California Polytechnic State
University, 1972.
- GRANNEMAN, GARY A. (1978)Engineering Technology
B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Associate Professor.
- GRANT, DONALD P. (1967) Architecture
B. Arch., University of Oklahoma, 1961; M. Arch., University of Utah, 1964; Ph.D., Univer-
sity of California, Berkeley, 1974. Professor.
- GRAVES, R. L., JR. (1951-54) (1957) Architecture
B.S., Architecture, University of Kansas, 1948; M. Arch. and Urban Design, Cranbrook
Academy of Art, 1950. Professor.

- 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. Associate Professor.
- GREENWALD, HARVEY C. (1973) Mathematics
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University, 1966; Ph.D., 1970. Associate Professor.
- GRIFFIN, JAMES B. (1971) Economics
B.A., University of Illinois, 1956; M.A., Wayne State University, 1963; Ph.D., 1968. Associate Professor.
- GRIFFIN, ROBERT E. (1976) Assistant to Foundation Executive Director
B.S., University of Southern California, 1966; J.D., Western State University, College of Law, 1974.
- 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. Associate Professor.
- GRINDE, DONALD A. (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. Associate Professor.
- GROSZ, DAVID W. (1967) Coach, Athletics
B.S., University of Oregon, 1960; M.S., 1965.
- 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.
- 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.
- 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 Science
B.S., California Polytechnic State University, 1973; M.S., Kansas State University, 1975. Assistant 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. Associate Professor.
- HALLOCK, BRENT G. (1979) Soil Science
B.S., University of California, Davis, 1970; M.S., 1972; Ph.D., 1976. Assistant Professor.
- HAMPTON, JOHN K., JR. (1976) Head, Biological Sciences Department
B.S., Millsaps College, 1947; Ph.D., Tulane University Graduate School, 1949. Professor.

- HANIGAN, EDWARD C., CPT (1980) Military Science
B.A., Arizona State University, 1971; Master of Counseling, 1973; Air Defense Officer Basic Course, 1973; IHAWK Missile Officer Course, 1974; Air Defense Officer Advance Course, 1977.
- HANKS, CHARLES J. (1954) Head, Mathematics Department
B.S., Pennsylvania State Teachers College at Shippensburg, 1942; M.A., University of Pennsylvania, 1949; Ed.D., University of Arkansas, 1954. Professor.
- HANNINGS, DAVID W. (1974) Ornamental Horticulture
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Assistant Professor.
- HANNULA, REINO (1962) Computer Science and Statistics
B.A., University of California, Los Angeles, 1960; M.A., 1965; additional graduate study, Institute of Computer Science, University of London, Tulane University, University of Massachusetts. 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) Library
A.B., University of Illinois, 1960; M.S.L.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. Assistant Professor.
- HARDEN, F. SHELDON (1948) Physical Education
B.A., Santa Clara, 1943; M.A., College of the Pacific, 1950. Professor.
- 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. Associate Professor.
- HARPER, LOUIS W. (1977) Crop Science
B.S., Montana State University, 1958; M.S., 1964. Assistant Professor.
- HARPER, RICHARD R. (1968) Coach, Athletics
B.S., University of California, Los Angeles, 1959; M.S., 1960.
- HARR, BERDY V. (1970) Coach, Athletics
B.A., California State University, Long Beach, 1958; M.S., Chapman College, 1972.
- 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.
- HARRIS, JOHN H. (1978) Natural Resources Management
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University, 1972. Assistant Professor.
- HARRIS, ROY M. (1954) Animal Science
B.S., Utah State Agricultural College, 1952; M.S., 1954; Ph.D., 1970. Professor.
- HARRIS, WALTER L. (1973) Educational Opportunity Program Counselor
B.S., California Polytechnic State University, 1973; M.A., 1975.
- 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. Assistant 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) Dean, School of Architecture
and Environmental Design
B. of Arch., University of Southern California, 1945.
- HATCHER, DAVID S. (1980) Head, Architectural Engineering Department
B.S., University of Wyoming, 1953; Ph.D., University of Illinois, 1961. Professor.
- HAUSER, RAYMOND J. (1969) Architectural Engineering
B.S.A.E., Northrop Institute of Technology, 1955; M.Ed., Chapman College, 1969. Associate
Professor.
- HAWES, MICHAEL (1968) Engineering Technology
B. Engr., University College, Dublin, Ireland, 1958; M.S., Ohio State University, Dayton,
1967. Professor.
- 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. Associate 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
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963; Ed.D., University
of Oregon, 1967. Professor.
- HEATON, RICHARD (1970) Associate Athletic Director—Men
B.A., Iowa State Teachers College, 1960; M.A., California State Polytechnic College, San
Luis Obispo, 1969.
- HEINZ, JOHN A. (1953) Director, Audiovisual
B.A., University of Washington, 1950; M.A., Ohio State University, 1964.
- HELLYER, GEORGE J. (1980) Agricultural Management
B.S., University of California, Davis, 1960; M.S., 1973. Assistant Professor.
- HENDEL, FRANK J. (1967) Aeronautical and Mechanical Engineering
B.S., Polytechnika Lwowska, Poland, 1935; M.S., 1937; Ph.D., 1941. Professor.
- HENDRICKS, FRANCIS (1969) City and Regional Planning
A.B., University of California, Berkeley, 1950; M.City & Regional Planning, 1953. Professor.
- HENRY, DAVID R. (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, EDWARD T. (1977) Animal and Veterinary Science
D.V.M., School of Veterinary Medicine, University of California, Davis, 1974.
- 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.
- HESCH, EARL R. (1956) Engineering Technology
B.S., University of New Mexico, 1955; M.S., Oklahoma A. & M. College, 1956. Associate
Professor.

- HEWITT, CLARISSA (1976)..... Art
B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy, 1976.
Associate Professor.
- HICKS, JR., CHARLES J. (1977) Counselor
B.S., Central State University, 1964; M.A., 1969; Ph.D., Ohio State University, 1971.
- HICKS, WILLIAM R. (1957) Physical Education
B.S., University of California, Los Angeles, 1950; M.A., Long Beach State College, 1959.
Professor.
- HILL, PATRICK D. (1975) Architecture
B. Arch., University of Illinois, 1970; M.S., 1972. Associate Professor.
- 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.
- HITCHCOCK, VAUGHAN D. (1962) Physical Education
B.S., Washington State University, 1956; M.A., San Francisco State, 1965. Professor.
- HIXSON, DOROTHY F. (1974) Registered Nurse
R.N., Salem Hospital School of Nursing, 1945; graduate studies, University of California,
Santa Barbara Extension, Cuesta College.
- HOFFMAN, KENNETH A. (1974) Physics
B.A., University of California, Berkeley, 1966; M.A., 1969; Ph.D., 1973. Associate 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.
- HOLLAND, V.L. (1972) Biological Sciences
B.A., Fresno State College, 1966; M.A., 1969; Ph.D., University of California, Berkeley, 1973.
Associate Professor.
- HOLLEY, F. JERALD (1961) Director, Admissions, Records and Evaluations
B.S., Utah State University, 1961; M.A., California State Polytechnic College, 1968.
- HOLLIS, MARK J. (1979) Registered Nurse II
B.S., physician's assistant, Oklahoma University. Diploma Nursing School, Wm. Beaumont
Army Medical Center, El Paso, Texas.
- 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.
- HOLTZ, WALTER E. (1954-66) (1968) Head, Environmental
Engineering Department
B.S., Illinois Institute of Technology, 1949; M.S., California Institute of Technology, 1953;
M.S., University of Washington, 1964. Professor.
- HOLZ, ALAN W. (1974) Mathematics
B.A., University of Washington, 1963; M.A., Bowdoin College, 1968; Ph.D., Purdue Univer-
sity 1972. Associate 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.M.E., Oregon State College, 1950; M.S.M.E., 1952. Professor.
- HOOD, J. MYRON (1977) Mathematics
B.A., Grinnell College, 1963; M.S., Northwestern University, 1965; Ph.D., Washington Uni-
versity, 1970. Assistant Professor.
- HOOKS, ROBERT D. (1966) Animal Science
B.S., California State Polytechnic College, 1961; M.S., Iowa State University, 1964; Ph.D.,
1966. Professor.

- HOOVER, ROBERT L. (1970) Head, Social Sciences Department
A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate
study, University of California, Berkeley, Stanford University. Associate Professor.
- HORTON, WILLIAM F. (1968) Coordinator, Engineering Science;
Associate Dean, School of Engineering and Technology
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of California, Los
Angeles, 1966. Professor.
- HOSTETTER, H. CLYDE (1958) Coordinator, Annual Giving
B.J., University of Missouri, 1949; graduate study, University of Missouri, University of
Southern California, American University, Arizona State University.
- HOULGATE, LAURENCE D. (1979) Philosophy
B.A., California State University, Los Angeles 1960; M.A., Ph.D., University of California,
Los Angeles, 1967. Associate Professor.
- HOULIS, JEROME F. (1959) Chemistry
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic
College. Assistant Professor.
- HOUSTON, ERNEST R. (1957) Ornamental Horticulture
B.S., Oklahoma State University, 1943; M.S., Ohio State University, 1947; additional gradu-
ate study, Oklahoma State University. Professor.
- HOWARD, LORRAINE H. (1964) Associate Dean, Women
B.S., Oregon State College, 1945; Ed.M., Oregon State University, 1961; Ph.D., 1964.
- HOWARD, WILLIAM A. (1980) Head, City and Regional Planning Department
B.A., University of Denver, 1958; M.A., 1960; graduate study, Johns Hopkins University,
1961-63; Ph.D. University of Edinburgh, 1973. Professor.
- HOWELL, ROBERT (1974) Art
B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Associate Professor.
- HSIEH, CARL C. F. (1970) Architectural Engineering
B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology,
1965; Ph.D., Northwestern University, 1968. Professor.
- 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) Head, Political Science Department
B.A., San Francisco State College, 1959; M.A., University of Idaho, 1969; Ph.D., 1971.
Professor.
- HUNT, ROGER M. (1979) Animal Science
B.S., California Polytechnic State University, 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; addition-
al 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.T., 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.M.E., Valparaiso University, 1961; M.S., University of California, Los Angeles, 1968;
Ph.D., 1971. Assistant Professor.
- IKENOYAMA, GEORGE K. (1964) Architecture
B.S., California State Polytechnic College, 1955; M.Arch., University of Hawaii, 1972.
Professor.
- IQBAL, M. ZAFAR (1979) Accounting
B.S., University of Nevada, Reno, 1969; M.B.A., Northern Illinois University, 1972; Ph.D.,
University of Nebraska, Lincoln, 1979. Professor.
- ITZKOWITZ, HOWARD F. (1974) Architecture
B. Arch., Rice University, 1963; M. Arch., Cranbrook Academy of Art, 1974. Associate
Professor.
- JACKSON, JUDY S. (1977) Registered Nurse
R.N., Cuesta College, 1970.
- JACOBS, JAMES W. (1967) Animal 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. Associate Professor.
- JAMES, RUTH H. (1971) Child Development and Home Economics
B.S., Iowa State University, 1943; M.A., California State College, Los Angeles, 1960; Ed.D.,
University of California, Los Angeles, 1968. 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
B.A., Muskingum College, 1968; M.S., Indiana University (1970-1976), Re.D., 1980. Assis-
tant Professor.
- JANEWAY, ROBERT K. (1972) Engineering Technology
B.S., California State Polytechnic College, 1951; M. Engr., California Polytechnic State
University, 1975. Associate Professor.
- JANKAY, PETER (1973) Biological Sciences
B.A., San Fernando Valley State University, 1966; M.S., 1969; Ph.D., University of Califor-
nia, Santa Barbara, 1973. Associate Professor.
- 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) Head, Crop Science Department
B.S., State College of Washington, 1950; M.S., 1951; Ph.D., Cornell University, 1953.
Professor.
- 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., and Ph.D., Northwestern University, 1974.
Assistant Professor.
- JOHNSON, MILES B. (1957) English
B.A., Gustavus Adolphus College, 1947; M.A., University of Minnesota, 1951; M.A., University
of Denver, 1953; M.A., University of Iowa, 1966; additional graduate study, University
of Washington, University of Southern California, University of Iowa. Associate Professor.
- JOHNSON, RICHARD F. (1950) Head, Animal and Veterinary Science Department
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) Associate Dean, Communicative Arts
and Humanities; Head, Art Department
Diploma of Teaching, New Zealand, 1948; Visual Arts Certificate, London University, 1950;
D.A., Glasgow School of Art and Architecture, 1952. Professor.
- JONES, DANE R. (1976) Chemistry
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Associate Professor.
- JONES, DOUGLAS C. (1976) Student Activities Information Director
B.A., University of California, Los Angeles, 1971.
- JONES, HAZEL J. (1974) Vice President for Academic Affairs
B.A., Western State College, Colorado, 1938; M.A., University of California, Berkeley, 1943;
M.Ed., University of Southern California, Los Angeles, 1958; Ed.D. 1963.
- JONES, JACK B. (1969) Education
B.A., University of California, Santa Barbara, 1957; M.A., 1965; Ed.D., University of Ari-
zona, 1970 U.S. Army Command and General Staff College, 1975. Professor.
- JONES, RICHARD V. (1969) Education
A.B., Fresno State College, 1949; M.A., 1952; Ed.D., University of California, Berkeley, 1958.
Professor.
- JORGENSEN, NANCY ANN (1968) Counselor
B.A., University of Hawaii, 1957; graduate study, Institute of Psychology, University of
Paris, University of Hawaii, University of California, Santa Barbara, University of Nevada,
Reno. Associate Professor.
- JUDD, W. BOYD (1956) Mathematics
B.S., St. Mary's College, 1939; M.A., University of California, 1951; D.Ed., Pennsylvania
State University, 1969. Professor.
- KABAT, HERBERT R. (1952) Physics
B.S., United States Naval Academy, 1938; M.A., Stanford University, 1951; additional gradu-
ate study, University of Southern California, Stanford University, University of Colorado.
Professor.
- KALATHIL, JAMES S. (1965) Physics
B.S., University of Madras, 1956; M.A., Southern Illinois University, 1963; Ph.D., University
of Nevada, 1977. Associate 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.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental Col-
lege, 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. Associate Professor.
- KAY, THOMAS D. (1958) Engineering Technology
B.S., Wayne State University, 1957; M.A., California State Polytechnic College, 1967.
Professor.

- KEECH, ROGER A. (1965) Aeronautical and Mechanical Engineering
B.S., California State Polytechnic College, 1955; M.S., University of Southern California, 1964. 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.
- KEETCH, BRENT H. (1967) English
B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971. Professor.
- KEIF, RODNEY G. (1960) Environmental Engineering
B.S., Kansas State University, 1949; M.S., Kansas State University, 1975. Professor.
- 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 University, San Jose, 1971. Professor.
- KENNEDY, EUEL W. (1974) Mathematics
B.S., East Central State College, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Associate Professor.
- KENNELLY, BRUCE (1947) Chemistry
B.S., University of Kentucky, 1944; M.S., Purdue University, 1946; Ph.D., Cornell University, 1952. Professor.
- KENYON, PAUL (1957) Business Administration
J.D., Southern Methodist University, 1949; M.A., California State Polytechnic College, 1959. Associate 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. Assistant 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, 1968; M.A., University of Oregon, 1970; Ph.D., 1973. Associate Professor.
- KIM, CHI SU (1974) Library
B.A., Dan Kook University, Seoul, Korea, 1959; M.A., University of Oregon, 1967; M.L.S., 1969. Associate Librarian.
- KLINE, KEN E. (1978) Ornamental Horticulture
B.S., California Polytechnic State University, 1972. Assistant Professor.
- KNABLE, ANTHONY E. (1973) Natural Resources Management
B.A., Blackburn College, 1965; M.A., Southern Illinois University, 1967; Ph.D., 1972. Associate Professor.
- KNECHT, GEORGE N. (1973) Biological Sciences
B.S., Rutgers University, 1962; M.S., 1969; Ph.D., University of Arizona, 1975. Associate Professor.
- KOBERG, DONALD J. (1962) Architecture
B.Arch., Tulane University, 1958; M.Arch., University of Washington, 1970. Professor.

- KOGAN, IRVIN J. (1957) Engineering Technology
B.A., Wayne University, 1954; M.A., Stanford University, 1955. Additional graduate study, Stanford University. Professor.
- KOURAKIS, JOSEPH M. (1970) City and Regional Planning
B.S. Arch., University of Illinois, 1954; M. Arch., University of Illinois, 1957; M. CRP, 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. Associate 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.
- LAMB, STEPHAN R. (1979) Program Coordinator, Housing
B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975.
- LAMBERT, ROYCE L. (1969) Soil Science
B.S., Purdue University, 1964; M.S., 1966; Ph.D., 1969. Professor.
- LAMBERT, WALTER M. (1975) Off-Campus Housing Coordinator
B.A. California State University, Long Beach, 1962.
- LAMOURIA, LLOYD H. (1965) Agricultural Engineering
B.S., Michigan State University, 1949; M.S., Iowa State University, 1950. Professor.
- LANDRETH, JAMES R. (1956) Director, Business Affairs
B.A., Mexico City College, 1954; M.B.A., Stanford University, 1956; additional graduate study, Claremont University College.
- LANDWEHR, ALFRED W. (1970) English
B.A. University of Missouri, 1963; M.A., 1964; Ph.D., 1970. Professor.
- LANE, BOBBIE A. (1970) Coach, Athletics
B.S., Baylor University, 1963; graduate study, Baylor University, San Diego State College, Central Washington State College.
- LANG, MARTIN T. (1969) Mathematics
B.A., North Central College, Naperville, Illinois, 1959; M.A., University of Kansas, 1963, Ph.D., University of Texas at Austin, 1973. Professor.
- LANGE, JOHN H. (1975) Architecture
B.S. Arch., University of Cincinnati, 1968; M. Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Associate Professor.
- LANGWORTHY, WILLIAM C. (1973) Dean, School of Science and Mathematics
B.S., Tufts College, 1958; Ph.D., University of California Berkeley, 1961.
- LARSEN, STUART E. (1969) Civil Engineering
B.S., University of Cincinnati, 1963; M.S., 1965; M.S. Eng., Arizona State University, Tempe, 1969. Professor.
- LaSALLE, TIMOTHY J. (1974) Dairy Science
B.S., California State Polytechnic College, 1970; M.S., Virginia Polytechnic Institute and State University, 1972. Associate Professor.

- LASCOLA, RUSSELL A. (1970) Philosophy
B.A., California State College at Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Professor.
- LASSANSKE, DANIEL E. (1974) Ornamental Horticulture
B.S., California Polytechnic State University, San Luis Obispo, 1970; M.S., 1971. Assistant Professor.
- LAZERE, DONALD P. (1977) English
B.A., Northwestern University, 1958; M.A., Columbia University, 1964; Ph.D., University of California, Berkeley, 1973. Associate Professor.
- LEE, PETER Y. (1981) Head, Civil Engineering Department
B.S. National Taiwan University, 1961; M.S. Tulane University, 1965; Ph.D., 1968. Professor.
- LEE, ROBERT E. (1978) Electronic and Electrical Engineering
B.A., University of California, Davis, 1963; M.S., 1966; Ph.D., Auburn University, 1979. Assistant Professor.
- LEE, THOMAS J. (1952) Physical Education
B.A., San Jose State University, 1949; M.A., Stanford University, 1950; M.A., Los Angeles State University, 1971. Professor.
- 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.
- LESCZYNSKI, DAVID B. (1976) Soil Science
B.S., Wisconsin State University, Stevens Point, 1967; M.S., University of Wisconsin, Madison, 1969; Ph.D., 1976. Associate Professor.
- LESLIE, JOHN E. (1980) Animal Science
B.S., University of Idaho, 1973; M.Ag., 1974. Graduate study, California Polytechnic State University, Pomona, 1976. Assistant Professor.
- 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. Library
B.A., University of Miami, 1950; M.A., 1953; M.A., Florida State University, 1957. Associate Librarian.
- LINDVALL, JOHN R. (1973) Associate Dean, School of Business
B.A., Whitman College, 1962; M.B.A., Indiana University, 1971; Ph.D., 1973. Professor.
- LINSTRUM, HELEN M. (1970) Assistant Admissions Officer
B.A., University of California, Los Angeles, 1961; M.A., California State Polytechnic College, San Luis Obispo, 1970.
- LINT, ROBERT G. (1967) English
A.B., University of Michigan, 1948; M.A., 1948, 1950; Ph.D., Ohio University, 1967. Professor.
- LIPKE, WILLIAM R., MAJ (1978) Military Science
B.A., University of Arizona, 1974; M.A., California Polytechnic State University, 1978.
- LITCHFIELD, PETER M. (1970) Psychology
B.A., University of Michigan, 1963; M.A., San Diego State College, 1967; Ph.D., University of Portland, 1971. Associate Professor.
- LITTLE, H. CLAY (1973) Agricultural Management
B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Associate Professor.

- LOH, ALICE C. (1974) Landscape Architecture
B. Arch., University of Manitoba, 1966; M.L.A., University of Oregon, 1972. Associate Professor.
- LOPER, WILLARD H. (1955) Agricultural Engineering
B.S., New York College of Agriculture, Cornell University, 1953. Associate 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, San Antonio, 1964; M.A., University of Illinois, 1966; Ph.D., University of Illinois, 1973. Assistant Professor.
- LUCAS, ROBERT A. (1975) Director, Research Development
A.B., John Carroll University, 1961; M.A., University of Illinois, 1963; Ph.D., 1970.
- LUKES, THOMAS M. (1962) Food Science
B.S., San Jose State College, 1947; M.S., University of California at 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. Assistant Professor.
- LUTHRA, SHAM S. (1972) Computer Science and Statistics
B.A., Panjab University, India, 1952; M.A., 1954; M.S., University of Alberta, Edmonton, Canada, 1969; Ph.D., University of Minnesota, 1974. Associate 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. Associate 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.
- MADSEN, EUGENE F., M.D. (1974) Medical Officer
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.
- MAGER, HANS L. (1949) Architectural Engineering
M.S., Royal University of Technology, Stockholm, 1947; Doctorate, Technical University of Vienna, Austria, 1975. Professor.
- MAGUR, LEON W. (1958) Physics
B.S., California State Polytechnic College, 1958; M.A., University of Northern Colorado, 1971; D.A., 1973. Associate Professor.
- 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.
- MALMBORG, FREDRICK B. (1969) Aeronautical and Mechanical Engineering
B.S., New York University, 1955; M.S., Columbia University, 1966. Associate Professor.
- MARK, WALTER R. (1972) Natural Resources Management
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Associate Professor.

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B.A., Inter-American University, San German, Puerto Rico, 1943; B.S., Louisiana State University, 1945; M.S., University of Illinois, 1957. Librarian.
- MARTINEZ, EUGENE J. (1980) Counselor
B.A., Western State College, 1969; M.A., 1974; Ph.D., University of Colorado, 1980.
- 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. Assistant 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. Assistant Professor.
- McCALEB, DONALD L. (1962) Public Information Officer
B.S., California State University, Los Angeles, 1958; M.A., California Polytechnic State University, 1970.
- 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 Polytechnic State University, 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. Associate Professor.
- McDONNELL, ROBERT A. (1975) Head, English Department
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, Master of Regional Planning, Cornell University, 1958. Professor.
- McGONAGILL, WILLARD L. (1967) Architecture
B.S., Colorado University, 1955; B. Arch., 1956. Associate Professor.
- McINTIRE, ROBERT H. (1977) Head, Management Department
B.S., Oklahoma State University, 1949; M.S., University of Colorado, 1960; Ph.D., University of Washington, 1968. Associate Professor.
- McINTYRE, LILIANA M. (1977) Assistant Registrar
B.A., San Francisco State University, 1969; M.A. California Polytechnic State University, 1973.
- 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. Associate 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. Associate Professor.
- McMICHAEL, MELVIN E. (1978) Management
B.A., Hiram College, 1955; M.B.A., University of Chicago, 1956; Ph.D., University of Texas, 1961; further graduate work Columbia University. Professor.

- McMORRAN, WAYNE E. (1962) Electronic and Electrical Engineering
B.S., California State Polytechnic College, 1960; M.S.E.E., New York University, 1962.
Professor.
- McNEIL, ROBERT J. (1976) Crop Science
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Assistant Professor.
- McRAE, GLENN G. (1963) Counselor
A.B., University of Tampa, 1949; M.Ed., University of Florida, 1954; D.Ed., 1959. Professor.
- 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.
- MESLER, FLORENCE (1962) Nurse Practitioner
R.N., Patterson General Hospital, New Jersey, 1939. Nurse Practitioner, Brigham Young University, 1974.
- METZ, L. DANIEL (1980) Aeronautical and Mechanical Engineering
B.S., University of Cincinnati, 1965; M.S., University of Detroit, 1967; Ph.D., Cornell University, 1971. Associate Professor.
- MEYERS, ROBERT E., JR. (1977) Physical Education
A.B., Stanford University, 1953; M.S., San Jose State University, 1965; D. Crim., University of California, Berkeley, 1974. Associate Professor.
- MILLER, ALLEN D. (1960) Mathematics
B.S., Iowa State University, 1945; M.S., 1948; Ph.D., 1953. Professor.
- MILLER, ERNEST C. (1968) Management
B.A., University of Chicago, 1941; M.B.A., 1946; Ph.D., University of Denver, 1954. Associate Professor.
- MILLER, HAROLD R. (1968) Accounting
B.S., University of Missouri, 1958; M.S., 1959. Associate Professor.
- MILLER, PAMELA COOK (1978) Speech Communication
B.A., Purdue University, 1968; M.A., 1970; Ph.D., University of Southern California, 1976. Assistant Professor.
- MILLER, STEVEN (1976) Coach, Athletics
B.S., Bradley University, 1966; M.S., California Polytechnic State University, 1978.
- MISIC, DRAGOSLAV M. (1970) Environmental Engineering
Diploma Engineer, University of Ljubljana, Yugoslavia, 1957; M.S., Ph.D., Northwestern University, 1963. Professor.
- 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; Additional graduate study, 1968. Associate Professor.
- MONTEEN, RALPH E. (1978) Natural Resources Management
B.S., University of Illinois, 1964; M.S., 1965; M.B.A., University of Denver, 1971; Ph.D., Colorado State University, 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 and University of California. Professor.
- MOREIRA, SIXTO EMILIO (1972) Architecture
B.S., University of Oklahoma, 1950; M. Arch., 1971; additional graduate study, University of California, Los Angeles. Associate Professor.

- 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. Associate Professor.
- MORGAN, ANN (1980) Child Development and Home Economics
B.A., Texas Tech University, 1971; M.A. 1975; Ph.D. 1980. Assistant Professor.
- MORGAN, DONALD E. (1968) Head, Industrial Engineering Department
B.S., Oregon State College, 1940; M.S., Stanford University, 1962; Ph.D., 1963. Professor.
- MORRIS, DON M. (1957-62) (1969) Associate Dean, Extended Education
B.S., M.A., California State Polytechnic College, 1953-1958; Ed.D., University of California Los Angeles, 1968.
- MORRIS, NANCY (1977) Agricultural Management
B.S., St. Louis University, 1966; M.Acc., University of Arizona, 1975. Assistant Professor.
- MORRISON, KENT E. (1979) Mathematics
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Assistant 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. Associate Professor.
- MOTT, JOHN H. (1967) English
B.A., Southern Oregon College, 1962; M.A., California Polytechnic State University, 1965; Ed.D., University of Northern Colorado, 1970. Professor.
- MOTT, W. STEPHEN (1972) Graphic Communications
B.S., California State Polytechnic College, 1959; M.A., 1973. Associate Professor.
- MOTTMANN, JOHN (1974) Physics
B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972. Associate Professor.
- MOY, CARL F. (1968) Dairy Science
B.S., University of Wisconsin, 1967. Associate Professor.
- MUELLER, THOMAS J. (1977) Director, Computer Center
B.A., Divine Word College, 1957; M.S., DePaul University, 1964; Ph.D., Oregon State University, 1973.
- MULDER, GEORGE (1968) Counselor
B.A., Long Beach State College, 1956; M.A., 1957; Ph.D., University of Southern California, 1971.
- MULLISEN, RONALD S. (1977) Aeronautical and Mechanical Engineering
B.S.M.E., California Polytechnic State University, 1969; M.Engr., 1976. 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.
- MURPHY, NORMAN C. (1976) Test Officer
B.G.E., University of Nebraska at Omaha, 1965; M.A., College of Idaho, 1968; Ph.D., University of Washington, 1971.
- 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. Associate professor.
- MURRAY, RANDALL L. (1977) Acting Head, Journalism Department
B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Associate Professor.
- NAKAMURA, RAYMOND M., (1980) Physical Education
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. Assistant Professor.

- NASH, JAMES H. (1978) Director, 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.
- 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.
- NEELANDS, JAMES G. (1957) Equipment Technician, Science and Mathematics
B.S., California State Polytechnic College, 1956; graduate study, University of Washington.
- NELSON, LAWRENCE H. (1972) Aeronautical and Mechanical Engineering
B.S., California Institute of Technology, Pasadena, 1958; M.S., University of California, Davis, 1971; Ph.D., 1972. Associate 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.
- NEWTON, MICHAEL B., CPT (1979) Military Science
B.A., Indiana University, 1974; M.A., Brigham Young University, 1978.
- NG, DINA N. (1976) Mathematics
B.S., University of San Carlos, Philippines, 1964; M.S., Oregon State University, 1970; Ph.D., 1973. Assistant Professor.
- NICOLAIDES, JOHN D. (1975) Aeronautical and Mechanical Engineering
B.A., Lehigh University, 1943; M.S.E., Johns Hopkins University, 1953; Ph.D., Catholic University of America, 1962. Professor.
- NIELSEN, KEITH E. (1959) Speech Communication
B.A., Alma College, 1953; M.A., Stanford University, 1959; M.A.Ed., California State Polytechnic College, San Luis Obispo, 1966; Ph.D., Michigan State University, 1970. Professor.
- NILES, PHILIP W.B. (1967) Environmental Engineering
B.S., University of California, 1957; M.S., 1958; additional graduate study, University of California, Los Angeles. Professor.
- NIU, SHIEN HWEI (1969) Library
B.A., National Taiwan University, 1951; M.A., Bucknell University, 1957; additional graduate study, University of Wisconsin; M.A. L.S., Indiana University, 1967. Senior Assistant 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. Associate Professor.
- NORDQUIST, RAYMOND E. (1964) Architecture
B.S., Arch., Montana State College, 1950; M. Arch., University of California, Berkeley, 1971. Professor.
- NOYES, O. ROBERT (1974) Food Science
B.A., Norwich University, 1963; M.Ed., University of Georgia, 1970; Ph.D., 1974. Associate Professor.
- NULMAN, DENNIS M. (1977) Education
B.A., University of San Diego, 1970; M.E.D., 1972; Ph.D., University of Southern California, 1977. Assistant 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.

- NYE, MARLENE (1975) Senior Clinical Laboratory Technologist
 B.S., California Polytechnic State University, San Luis Obispo, 1967.
- OCHYLSKI, MARSHALL E. (1978) Ornamental Horticulture
 B.A., University of Michigan, 1970; M.L.A., 1973. Assistant Professor.
- O'CONNOR, EUGENE L. (1964) Business Administration
 B.S., St. Louis University, 1957; M.S., 1963. Associate Professor.
- OFFERMANN, GENE P. (1970) Crop Science
 B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis,
 1970. Associate Professor.
- O'FLAHERTY, SUSAN (1977) Counselor, Financial Aid
 B.A., Adelphi University, 1972; M.A., California Polytechnic State University, 1981.
- O'LEARY, MICHAEL J. (1951) Social Sciences
 A.B., San Francisco State College, 1950; M.A., Stanford University, 1951; additional graduate
 study, Stanford University, University of Oregon. 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.
 Associate Professor.
- O'NEILL, GERTRUDIS M. (1972) 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. Assistant Librarian.
- ORR-CAHALL, CHRISTINA (1978) Art
 B.A., Mount Holyoke College, 1969; M.A., Yale University, 1974; M.Phil., 1975; Ph.D., 1979.
 Assistant Professor.
- 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. Associate Professor.
- ORTIZ, MARIA E. (1972) Biological Sciences
 B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Women's University,
 1973. Associate Professor.
- OSBALDESTON, ROGER (1972) Landscape Architecture
 Diploma in Architecture, School of Architecture, Nottingham, England, 1957; M.L.A., Uni-
 versity of Pennsylvania, 1961. Associate Professor.
- OSTEYEE, LEON F. (1957) Aeronautical and Mechanical Engineering
 B.M.E., Rensselaer Polytechnic Institute, 1945; M.M.E., 1957; additional graduate study,
 Massachusetts Institute of Technology. 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, Lawrence, 1975.
 Professor.
- PAGE, PERRYMAN L. (1963) Library
 B.A., University of Mississippi; M.S.L.S., Louisiana State University, 1963. Associate
 Librarian.
- PAPAKYRIAZIS, PANAGIOTIS A. (1971) Economics
 B.A., Athens School of Economics and Business Science, 1964; Ph.D., University of Califor-
 nia, San Diego, 1974. Associate Professor.

- PARKER, FRANCES J. (1980) Head, Child Development
and Home Economics Department
B.S., California State College, Northridge, 1965; M.S., California State College, Long Beach,
1967; Ph.D., Ohio State University, 1969. Professor.
- 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. Assistant
Professor.
- PAUL, GORDON J. (1969) Accounting
B.S., Montana State College, 1957; M.B.A., University of New Mexico, 1966. Assistant
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; Ph.D. 1979. Assistant Professor.
- PELLATON, EVELYN I. (1966) Associate Athletic Director—Women
B.A., San Francisco State College, 1950; M.A., 1953. 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, School of Medicine. 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) Nurse Practitioner
B.S., University of the Philippines, 1961.
- PERLICK, WALTER W. (1979) Head, Business Administration Department
B.S., M.S., Northern Illinois University, 1965; Ph.D., Pennsylvania State University, 1973.
Professor.
- PERRYMAN, ELIZABETH K. (1972) Biological Sciences
B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., Uni-
versity of Arizona, 1972. Associate Professor.
- PETERS, RALPH A. (1969) Physics
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Ford-
ham 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.
- PEZO-SILVA, ARMANDO A. (1973) Acting Director, Educational
Opportunity Program
B.S., California Polytechnic State University, 1970; M.A., 1974; M.S., 1979.
- PHAKLIDES, WILLIAM J. (1963) Engineering Technology
B.S., California State Polytechnic College, 1956; graduate study, Montana State University.
Professor.
- PHILLIPS, DENNIS R. (1976) Chemistry
B.A., Whitman College Washington, 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. Associate Professor.

- PHILLIPS, PETER K. (1968)Facilities Planner
B.S., California State Polytechnic College, 1959.
- PHILLIPS, SHERMAN A., JR. (1979) Crop Science
B.S., Northeast Louisiana University, 1971; M.S., 1973; Ph.D., Texas A & M., 1979. Assistant
Professor.
- PHILLIPS, WILLIAM R. (1957) Architectural Engineering
B.Arch., University of Southern California, 1952; M.Arch., University of Hawaii, 1971.
Professor.
- PIEL, DANIEL D. (1980) Art
B.A., Yale University, 1951; B.F.A., Pratt Institute, 1954; M.S., 1971. Associate Professor.
- PILLSBURY, NORMAN H. (1974) Natural Resources Management
B.S., Humboldt State University, 1968; M.S., 1972; Ph.D., Colorado State University, 1976.
Associate Professor.
- PIMENTEL, RICHARD A. (1952) Biological Sciences
A.B., San Jose State College, 1947; M.S., Oregon State College, 1950; Ph.D., 1952. Professor.
- PINARD, LEO W., II (1970) Social Sciences
B.A., University of Santa Clara, 1962; M.A., University of Notre Dame, 1963; Ph.D., 1971.
Associate Professor.
- PIPER, CURTIS DEAN (1964) Head, Soil Science Department
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.
- PITTMAN, NANCY A. (1972)Counselor, Financial Aid
B.S., University of Wisconsin, La Crosse, 1968; M.S., California Polytechnic State University,
1974; M.A. 1975.
- PLUMMER, WILLIAM E. (1979) Animal Science
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979.
Assistant Professor.
- POHL, JENS G. (1973) Architecture
B. Arch., University of Melbourne, Australia, 1964; M. Building Science, University of
Sydney, Australia, 1977; Ph.D., 1970. Professor.
- POLING, JOHN E. (1976) Physics
B.A., University of Chicago, 1965; M.S., University of Iowa, 1969; Ph.D., 1975. Associate
Professor.
- POLK, BENJAMIN K. (1966) Architecture
Diploma, School of Planning and Research in Regional Development, England, 1952. Associ-
ate Professor.
- 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.
- PRICE, CARROLL D. (1981) Director, Development
B.A., Pennsylvania State University, 1963; M.S., 1972.
- PRICE, D. JOHN (1957) Aeronautical and Mechanical Engineering
National Certificate in M.E., Dudley and Staffordshire Technical College, 1950; B.S., Cali-
fornia State Polytechnic College, 1954. Associate Professor.
- PRITCHARD, EILEEN ELLEN (1973)Library
B.A., California State University, Chico, 1961; Ph.D., University of Kansas, 1967; M.L.,
Kansas State Teachers College, 1972. Senior Assistant Librarian.

- PROCTOR, ANDREW J. (1973) Physical Education
B.S., California Polytechnic State University, 1970; M.S., 1971; Ph.D., University of Utah, 1978. Assistant Professor.
- PUNCHES, GERALD N. (1971) Registrar
B.A., Western Washington State College, 1970; M.Ed., 1971; additional graduate study, University of California, Santa Barbara.
- QUINLAN, CHARLES W. (1966) Architecture
B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor.
- 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) Head, Physical Education Department
B.S., Murray State University, 1959; M.S., Indiana University, 1959; D.P.E., 1969. Professor.
- RALSTON, DAVID W. (1976) Medical Officer
B.A., University of California, Irvine; B.S., 1969; M.D., University of Southern California, 1973; Diplomate American Board of Internal Medicine, 1976.
- RANDAZZO, ANTHONY JAMES (1977) Industrial Technology
B.A., San Jose State College, 1965; M.A., 1968; Ph.D., Washington State University, 1976. Assistant Professor.
- RATCLIFFE, RONALD V. (1963) Music
B.A., University of Washington, 1956; M.M., University of Southern California, 1958. Professor.
- RATHBUN, LARRY P. (1970) Head, Agricultural Education Department
B.S., California Polytechnic State University, San Luis Obispo, 1964; M.A., 1967; Ph.D., Ohio State University, 1974. Associate Professor.
- RAWLINGS, DON (1980) Mathematics
B.S., Arizona State University, 1974; M.A., University of California, San Diego, 1976; Ph.D., 1978. Assistant Professor.
- REA, SHIRLEY M. (1980) Radiologic Technologist
University of Texas, M.D. Anderson Hospital and Tumor Institute School of Radiologic Technology, 1964, A.R.R.T., C.R.T.
- REED, JAMES W. (1975) Speech Communication
B.A., Pasadena College, 1968; M.A., Southern Illinois University, 1970; Ph.D., 1972. Assistant Professor.
- REESE, JEANETTE M. (1976) Health Educator
B.A., University of California, Santa Barbara, 1975; M.A., University of San Francisco, 1981.
- REGAN, RONALD D. (1977) Head, Ornamental Horticulture Department
B.S., California State Polytechnic College, 1951; M.A., Los Angeles State College, 1959; additional graduate study, University of Southern California. Professor.
- 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 University, San Luis Obispo, 1970. Professor.
- RHOADS, HOWARD (1956) Crop Science
B.S., Montana State University, 1951; M.S., 1952. Professor.
- RICE, MARILYNN F. (1978) Education
A.B., University of California, Los Angeles, 1960; M.Ed, California State University, Northridge, 1969; Ph.D., University of California, Santa Barbara, 1977. Assistant Professor.

- RICE, ROBERT P. (1976) Ornamental Horticulture
B.S.A., University of Georgia, 1973; M.S., 1974; Ph.D. Michigan State University, 1977.
Assistant Professor.
- 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.
- 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.
- RIDDELL, STEVEN G. (1975) Coordinator, Alumni Services
B.A., California Polytechnic State University, 1969; M.A., 1977.
- RIDER, ROL W., JR. (1960) Business Administration
B.A., University of California, 1941; M.A., 1967; Ph.D., University of Oregon, 1972.
Professor.
- RIEDLSPERGER, MAX E. (1969) History
A.B., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado,
1969. Professor.
- RIFE, WILLIAM C. (1977) Head, Chemistry Department
B.A., North Central College, 1956; Ph.D., University of Illinois, 1960. Professor.
- RIGGINS-PIMENTEL, RHONDA L. (1972) Biological Sciences
B.S., Austin Peay State College, Tennessee, 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.
- 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.
- ROCKMAN, ILENE F. (1975) Library
B.A., University of California, Los Angeles, 1972; M.S.L.S., University of Southern California,
1974; M.A., California Polytechnic State University, 1978. Senior Assistant Librarian.
- RODGER, JAMES A. (1976) Acting Head, Construction Department
Bachelor of Building Construction, University of Florida. 1970; M.S. Building Construction,
University of Florida, 1977. Assistant 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. Assistant Professor.
- ROGERS, ROBERT L. (1974) Engineering Technology
B.S., California Maritime Academy, 1969; M.S., Stanford University, California, 1972. As-
sociate Professor.
- ROGERS, ROLF E. (1975) Management
M.A., University of Washington, 1968; Ph.D., 1970. Professor.
- ROGERS, RONALD C. (1981) Business Administration
B.S., University of Baltimore, 1969, M.S., University of Southern California, 1977, additional
graduate study, Ohio State University. Associate Professor.

- ROLLINGS, DAVID R. (1968) English
 A.B., University of Louisville, 1948; M.A., University of Michigan, 1949; additional graduate study. 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.
- ROSENMAN, MONA G. (1971) English
 B.A., University of Michigan, 1955; M.A., Case-Western Reserve University, 1960; Ph.D., Kent State University, 1970. Associate 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, 1955; M.A., 1958; Ph.D., University of Oregon, 1975. Associate 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. Associate 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, JOHN G. (1968) Music
 A.B., California State University, Fresno, 1959; M.A., California State University, Chico, 1968. Professor.
- RUTHERFORD, ROBERT T. (1974) Animal Science
 B.S., University of California, Davis, 1970; graduate study, University of California, Davis, 1971. Assistant Professor.
- RUTTY, KIP (1978) Public Affairs
 B.A., University of California, Berkeley, 1968.
- RYAN, L. DIANE (1974) Counselor, Financial Aid
 B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1976.
- SAAM, PATRICIA (1966) Child Development and Home Economics
 B.S., College of St. Catherine, St. Paul, 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. Associate Professor.
- SABTO, JACQUES C. A. (1968) Electronic and Electrical Engineering
 B.E.E., Cairo University, 1948; Ingenieur Radio-ESE, Ecole Superieure 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.
- 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 Universitat, Berlin, 1970-71. Associate Professor.

- SANCHEZ, DAVID J. (1970) Coordinator, Ethnic Studies; Education
B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa
Barbara. Associate Professor.
- SANDERSON, JAMES D. (1967) Coach, Athletics
A.B., Fresno State College, 1962; M.S., California State Polytechnic College, 1969.
- 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 State University, 1980.
Associate Professor.
- SCHAEFFER, PAUL E. (1964) Industrial Engineering
B.M.E., University of Minnesota, 1947; M.S., University of Southern California, 1959. Pro-
fessor.
- SCHLEICHER, HELMUT L. (1970) Construction
B.A., Kaiser-Friedrich Mannheim College, Germany, 1936; M.S., Technical University, Mu-
nich, Germany, 1945; Ph.D., University of Munich, Germany, 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. Associ-
ate Professor.
- SCHULTZ, NED W. (1976) Child Development and Home Economics
B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976.
Assistant 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, ARTHUR L. (1975) Business Administration
B.B.A., University of Michigan, 1967; M.B.A., 1968; Ph.D., University of Oregon, 1975.
Associate Professor
- SCHWARTZ, KENNETH E. (1952) Associate Dean, 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.
- SCOTT, JACK F. (1967) Agricultural Management
B.S., California State Polytechnic College, 1961; M.A., 1967. Professor.
- SCOTT, PAULA ROSEMARY (1973) Library
B.A., University of California, Los Angeles, 1965; M.L.S., 1966; graduate study, M.A., Monte-
rey Institute of Foreign Studies, 1974. Senior Assistant Librarian.
- SCOTTO, KENNETH C. (1970) Animal Science
B.S., California Polytechnic State University, San Luis Obispo, 1966; M.S., University of
Nevada, 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.
- SEDLITZKY, MARCEL E. (1972) Architecture
Candidate of Architecture Technical University, Graz, Austria, 1949; B.S. Arch., University
of Cincinnati, 1952; M. Arch., University of California, Berkeley, 1973. Professor.
- SEIM, EDWIN C. (1978) Soil Science
B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Assis-
tant Professor.

- SENNETT, ROBERT EARL (1970) Civil Engineering
B.S., University of Pennsylvania, Philadelphia, 1959; M.S., 1961; Ph.D., 1963. Professor.
- SERVATIUS, OWEN L. (1947) Management
B.S., California State Polytechnic College, 1959; M.A., 1964. Professor.
- 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.
Assistant Professor.
- SHAH, RAMESH T. (1969) Aeronautical and Mechanical Engineering
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermas-
chinenbau, Magdeburg, Germany, 1959. Professor.
- SHANK, CAROLYN B. (1974) Physical Education
B.S., California Polytechnic State University, 1969; M.S., 1975; Ed.D., University of Utah,
1981. Assistant Professor.
- SHARP, HARRY W., JR. (1975) Head, Speech Communication Department
A.B., University of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Assistant
Professor.
- SHARP, JOSEPH C. (1980) Computer Science and Statistics
B.A., University of California, Berkeley, 1954; M.S., 1965; Ph.D., 1966. Professor.
- SHEIK, HABIB (1967) English
B.S., California State University, Fresno, 1959; A.B., 1960; M.A., California Polytechnic State
University, 1961; M.A., University of California, Los Angeles, 1966; Ph.D., University of
Nebraska, 1979. Associate Professor.
- SHELTON, DONALD L. (1973) Director, Personnel Relations
B.G.E., University of Omaha, 1958; B.S., University of Southern California, 1960; M.S., 1960.
- SHIERS, ALDEN F. (1975) Economics
B.S., University of Maine, 1967; Ph.D., University of California, Santa Barbara, 1977. Associ-
ate Professor.
- SILVA, CLAUDIO Y. (1975) Foreign Languages
B.A., Claremont Men's College, 1951; M.A., University of Southern California, 1964; Ph.D.,
1970. Associate Professor.
- SILVER, GORDON A. (1964) Physics
B.S., University of California, Los Angeles, 1959; M.S., 1961; additional study, University of
California, Berkeley. Associate Professor.
- SILVERS, ARTHUR H. (1976) Architecture
B. Arch., University of Southern California, 1959; M.A., 1978. Associate Professor.
- SILVESTRI, MICHAEL G. (1978) Chemistry
B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa
Cruz, 1977. Assistant Professor.
- SIMEK, JAN. W. (1977) Chemistry
B.A., Kalamazoo College, 1970; M.S., Stanford University, 1971; Ph.D., 1975. Assistant Pro-
fessor.
- 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 Univer-
sity, 1975. Associate Professor.
- SMALL, DANIEL (1978) Medical Officer
A.B., Brown University, 1971; M.M.S., 1973; M.D., 1975; Diplomate American Board of
Internal Medicine, 1978; Diplomate American Board of Rheumatology, 1980.

- 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., School of Veterinary Medicine, University of California, Davis, 1971; D.V.M., 1973. Associate Professor.
- SMITH, DOUGLAS B. (1977) English
B.A., Johns Hopkins University, 1969; M.A., Fairfield University, 1975; additional study, Rensselaer Polytechnic Institute. Assistant Professor.
- SMITH, GERALD L. (1980) Head, Landscape Architecture Department
B.S.L.A., Iowa State University, 1961; M.L.A., University of Illinois, 1968. Professor.
- SMITH, HOLLY (1976) Program Coordinator, Activities Planning Center
B.S., San Jose State University, 1975.
- SMITH, HOWARD F. (1968) Economics
A.B., Wayne State University, 1940; M.B.A., Harvard University, 1942; M.A., American University, 1952; Ph.D., 1963. Professor.
- SMITH, J. MURRAY (1960) Speech Communication
B.A., University of Denver, 1940; M.A., 1947. Professor.
- SMITH, KEITH V. (1978) Agricultural Education
B.S., California Polytechnic State University, San Luis Obispo, 1958; M.A., 1964. 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, PATRICK DAVIS, JR. (1975) Production Supervisor IMP/VEP
B.A., Florida Technological University, 1975; graduate study, California Polytechnic State University.
- 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) Admissions Officer
B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975.
- SOMPPI, SUSAN (1978) Reading Specialist, Educational Opportunity Program
B.S., University of Texas, 1970; M.A., California Polytechnic State University, 1978.
- SORENSEN, L. ROBERT (1966) Head, Psychology Department
B.A., Pomona College, 1948; M.A., Claremont Graduate School, 1951; Ph.D., 1966. Professor.
- SOTO, SHIRLENE A. (1977) History
B.A., San Francisco State University, 1969; M.A., University of New Mexico, 1971; Ph.D., 1977. Assistant Professor.
- 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.
- SPENCER, RUTH G. (1967) Library
B.A., Milwaukee-Downer College, 1938; B.L.S., University Library of Chicago, 1945; additional graduate study, University of Wisconsin. Senior Assistant Librarian.

- SPODEN, PATRICIA S. (1975) Assistant Director, Activities Planning Center
 B.A., St. Cloud University, 1969; M.A., University of Iowa, 1971.
- STAHL, VERLAN H. (1968) Head, Foreign Languages Department
 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
 B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University
 of Utah, 1974. 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.
- STARKEY, EUGENE E. (1978) Head, Dairy Science Department
 B.S., California Polytechnic State University, 1952; M.S., University of Wisconsin, 1954;
 Ph.D., 1958. Professor.
- STEARNS, JOSEPHINE S. (1969) Child Development and Home Economics
 B.A., University of New Hampshire, 1958; M.A., Michigan State University, 1969. Associate
 Professor.
- STECHMAN, JOHN V. (1960) Animal Science
 B.S., University of California, Davis, 1957; M.S., 1960. Professor.
- STEELE, F. RAYMOND, JR. (1968) Food Science
 B.A., California Polytechnic State University, 1956; M.S., Cornell University, 1967; Ph.D.,
 1968. 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, JOSEPH W., LTC (1979) Head, Military Science Department
 B.S., United States Military Academy, 1961; Engineer Officer Basic Course, 1961; Airborne,
 1961; M.E., Texas A&M University, 1966; Engineer Officer Advance Course, 1967; Armed
 Forces Staff College, 1976.
- STEWART, PATRICIA A. (1971) Coordinator, Learning Assistance Center
 B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State Univer-
 sity, 1972.
- STINE, WILLIAM B. (1973) Aeronautical and Mechanical Engineering
 B.S., West Virginia University, 1958; M.B.A., University of Southern California, 1963; M.S.,
 1963; Ph.D., 1972. Associate Professor.
- STOCKER, STEVEN O. (1969) Engineering Technology
 B.S.E.L., California Polytechnic State University, 1973; M. Engr., 1979. Assistant Professor.
- STOFFEL, EDWARD O. (1957) Aeronautical and Mechanical Engineering
 B.M.E., University of Santa Clara, 1950; M.E., 1955; M.S.M.E., Oregon State University,
 1968. Professor.
- STOWE, KEITH S. (1971) Physics
 University of Gottingen, Germany, 1964; B.S., Illinois Institute of Technology, 1965; Ph.D.,
 University of California, San Diego, 1971. Associate Professor.
- STRASSER, J. EDWARD (1960) Industrial Technology
 B.S., California State Polytechnic College, 1958; M.B.A., Golden Gate College, 1967.
 Professor.
- STRICKMEIER, H. BERNARD (1970) Mathematics
 B.S., Texas Lutheran College, 1962; M.A., University of Texas, 1967; Ph.D., 1970. Associate
 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.

- STUART, JOHN S. (1964) Architecture
B.Arch., Texas Technological College, 1950; M.A., California Polytechnic State University, 1974. 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. Assistant 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.
- SUHR, MOON JA MINN (1969-71) (1972) Physical Education
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., Colorado State College, 1969. Associate Professor.
- SULLIVAN, GERALD J. (1968) English
B.A., University of Wichita, 1957; M.A., University of Oklahoma, 1959; Ph.D., 1964. Professor.
- SUMMERL, PAMELA (1974) Coordinator, Job Development
B.S., California State University, Long Beach, 1974; M.B.A., California Polytechnic State University, San Luis Obispo, 1976.
- SUMMERS, MARY JO (1962) Registered Nurse
R.N., University of Oregon, Eugene, 1939; B.S., 1939.
- SUTLIFF, DALE A. (1973) Landscape Architecture
B.S.L.A., California State Polytechnic University, Pomona, 1965; M.R.P., University of Pennsylvania, 1973. Associate Professor.
- SWANSEN, VERN (1971) Architecture
B. Arch., University of Southern California, 1939; M. Arch., University of Strathclyde, 1975. Associate Professor.
- SWANSON, BESSIE R. (1977) Head, Music Department
A.B., B.Mus., University of the Pacific, 1943; M.A., 1952; Dr. Mus. Arts, Stanford University, 1967. Professor.
- 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.
- SYER, JOHN C. (1975) Political Science
B.A., Trinity College, Connecticut, 1962; M.A., University of California, Santa Barbara, 1968; Ph.D., 1973; additional graduate study, University of Michigan. Associate Professor.
- TALBOTT, LAURENCE F. (1966) Head, Industrial Technology Department
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.
- TARTAGLIA, RICHARD A. (1959) Associate Director, Plant Operations
B.S., California Polytechnic State University, 1957.
- TASKEY, RONALD D. (1977) Soil Science
B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University, 1978. Assistant Professor.
- TAYLOR, QUINTARD, JR. (1977) History
B.A., Saint Augustine's College, 1965; M.A., University of Minnesota, 1971; Ph.D., 1977. Assistant 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. Associate Professor.
- THOMAS, GUY H., JR. (1968) Acting Head, Graphic Communications Department
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.
- THULIN, ANDREW J. (1979) Animal 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) Associate Dean, Student Affairs
B.A., Chico State College, 1965; M.A. Idaho State University, 1969.
- 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 Catholica 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.L.A., State University of New York, 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.
- VALPEY, ROBERT G. (1972) Dean, School of Engineering and Technology
B.S., United States Military Academy, 1945; B.M.E., Cornell University, 1950; M.S., University of Colorado, 1958; Ph.D., University of Illinois, 1962.
- VANCE, ROBERT D. (1972) Head, Food Science Department
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971. Associate Professor.
- 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. Associate Professor.
- VARNEY, ALVIN DAVID (1969) Engineering Technology
B.S., Le Tourneau College, Longview, Texas, 1964. Associate Professor.
- VIERRA, RODGER (1978) Agricultural Engineering
B.S., California Polytechnic State University, San Luis Obispo, 1962; M.S., 1978. Assistant Professor.
- VILKITIS, JAMES R. (1980) Natural Resources Management
B.S., Michigan State University, E. Lansing, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973-74. Assistant Professor.
- VIX, MARLIN DALE (1977) Agricultural Management
B.S., San Jose State University, 1968; M.S., California Polytechnic State University, 1977. Assistant Professor.
- VOELTZ, HERMAN C. (1965) History
B.A., University of Chicago, 1943; M.A., 1949; Ph.D., University of Oregon, 1960. Professor.
- VOITILE, ROBERT A. (1979) Head, Poultry Department
B.S., West Virginia University, 1962; M.S., 1964; Ph.D., University of Tennessee, 1969. Professor.
- VOSS, LARRY R. (1968) Executive Assistant to the President
B.A., Sacramento State College, 1956; graduate study, Sacramento State College and California State College at Los Angeles.
- WADDELL, JOSEPH JAMES (1976) Library
B.A., California State College at San Bernardino, 1972; M.L.S. University of California, Los Angeles, 1975. Assistant Librarian.
- WADLINGTON, FAYE (1973) Nurse Practitioner
R.N., Wichita St. Joseph School of Nursing, Kansas, 1947; additional study, Los Angeles City College, University of California, Los Angeles.
- 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) Director, University Library
B.A., Eastern Oregon College, 1958; M.L.S., University of Illinois, 1962; Ph.D., University of Utah, 1973.
- WALKER, HOWARD D. (1957) Chemistry
B.A., New York University, 1947; M.S., 1948; Ph.D., U.C.L.A., 1955. Professor.
- WALKER, ISAAC N. (1967) English
B.S., Northwestern University, 1953; M.A., University of Texas, 1955; Ph.D., 1965. Professor.
- WALKER, KENDRICK W. (1973) Head, Philosophy Department
B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Associate Professor.
- WALL, LEONARD W. (1969) Physics
B.S., Louisiana Polytechnic Institute, 1963; Ph.D., Iowa State University, 1969. Professor.
- WALL, MATT R. (1976) Construction
B.S., University of Wisconsin, 1962; M.B.A., 1972; Ph.D., Texas A&M, 1976. Associate Professor.
- WALLACE, WILLIAM CARL (1970) Counselor
B.S., California Polytechnic State University, San Luis Obispo, 1967; M.A., 1973; additional graduate study, University of California, Santa Barbara.
- WALTER, VIRGINIA R. (1974) Ornamental Horticulture
B.S., Ohio State University, 1970; M.S., 1972. Assistant Professor.

- WALTERS, DIRK R. (1969) Biological Sciences
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969.
Professor.
- WALTERS, ROBERT W. (1970) Assistant Director, Activities Planning Center
B.A., California State College, Fullerton, 1962; M.A., California Polytechnic State University, 1971.
- WAMBACH, ROBERT F. (1981) Head, Natural Resources Management Department
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 Polytechnic State University, 1969; M.S., University of California, Davis, 1972. Associate Professor.
- WARD, EDWARD JOHN (1970) City and Regional Planning
B.S., University of Massachusetts, 1962; M.U.P., Michigan State University, 1964. Professor.
- WARD, WESLEY S. (1954) Architecture
B. Arch., University of Southern California, 1953; graduate study, Spain. 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.
- WARTEN, RALPH M. (1968) Mathematics
B.S., Brooklyn College, 1957; M.S., Purdue University, 1959; Ph.D., 1961. Professor.
- 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
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. Associate 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.
- WEISENBERGER, GARY L. (1975) Agricultural Engineering
B.S., California Polytechnic State University, 1973; M.S., 1976. Assistant 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) Associate Executive Vice President
B.A., Pepperdine College, 1956; M.A., California State Polytechnic College, 1971.
- WEST, JOHN W. (1968) Associate Dean, School of Agriculture and Natural Resources
B.S.A., University of Tennessee, 1947; M.S., 1948; Ph.D., Purdue University, 1951. Professor.
- WESTOVER, JAMES D. (1971) Chemistry
B.S., Arizona State College, 1960; M.S., 1962; Ph.D., Brigham Young University, 1966.
Associate Professor.
- WHALEY, GLENN V. (1963) Library
B.A., Carroll College, 1949; M.L.S., University of Wisconsin, 1953; M.A., Drake University, 1965. Associate Librarian.
- 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 University, 1978. Assistant Professor.
- WHEATLEY, PATRICK O. (1970) Computer Science and Statistics
B.A., St. Mary's Seminary, 1956; M.S., The University of Chicago, 1963; Ph.D., University of Houston, 1970. Professor.
- WHEELER, ERNEST J., JR. (1969) Coach, Athletics
B.A., University of Washington, 1961; M.S., University of Southern California, 1966.
- WHEELER, MARYLINDA (1975) Physical Education
B.A., Stanford University, 1958; M.A., 1959; Ph.D., University of Utah, 1979. Associate Professor.
- WHEELER, ROBERT R. (1961) Animal 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.
- WILEY, RICHARD C. (1946) Head, Metallurgical
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