Attention, Prospective Students

A GUIDE TO PLANNING FOR COLLEGE

Below are listed basic questions which you should ask as you plan for your college education. Page references indicate where in this publication you can find the answers as they pertain to California State Polytechnic College.

In what fields of instruction does the college offer degrees?
Agriculture, at San Luis Obispo, page 63, and at Kellogg Campus, page 277.
Engineering, at San Luis Obispo, page 123, and at Kellogg Campus, page 313.
Applied Arts (including business), at San Luis Obispo, page 171.
Applied Sciences, at San Luis Obispo, page 225.
Arts and Sciences (including business) at Kellogg Campus, page 345.

Does the college offer nondegree occupational curricula? Page 64.

Can I meet the requirements for admission? Page 21.

May a student transfer from another college? Pages 21, 22.

What fees are charged? Page 57; at Kellogg Campus, page 271.

Where can I obtain board and room? Page 42; at Kellogg Campus, page 266.

What scholarships are available to freshmen? At San Luis Obispo, page 46 and at Kellogg Campus, page 267.

Does the college have an ROTC unit? Page 43.

What services does the college maintain for students?
Counseling and testing, at San Luis Obispo, page 44; at Kellogg Campus, page 266.
Advising, at San Luis Obispo, page 44; at Kellogg Campus, page 266.
Health, at San Luis Obispo, page 44; at Kellogg Campus, page 266.
Assistance in finding part-time employment, at San Luis Obispo, page 46; at Kellogg Campus, page 266.
Loan funds, at San Luis Obispo, page 52; at Kellogg Campus, page 269.
Placement at graduation, at San Luis Obispo, page 46; at Kellogg Campus, page 266.

Where do I write for further information?
San Luis Obispo Campus, San Luis Obispo, California
Kellogg Campus, Pomona, California
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CALIFORNIA STATE POLYTECHNIC COLLEGE

ACADEMIC CALENDAR—1964-65

SUMMER QUARTER, 1964

(Kellogg Only)

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SUMMER QUARTER, 1964

(San Luis Obispo Only)

Four-week Term

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<td>Tuesday</td>
<td>Classes begin for all students</td>
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<td>July 24</td>
<td>Friday</td>
<td>Last day to add or drop courses without penalty</td>
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<tr>
<td>August 27-28</td>
<td>Thursday-Friday</td>
<td>Final examinations</td>
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<tr>
<td>August 28</td>
<td>Friday</td>
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<td>Date</td>
<td>Day</td>
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<td>September 1</td>
<td>Tuesday</td>
<td>Last day to file application for admission to fall quarter</td>
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<td>September 14</td>
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<td>Tuesday</td>
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<td>Last day to enroll for winter quarter</td>
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<td>March 24-28</td>
<td>Wednesday-</td>
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<td></td>
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TENTATIVE SUMMER QUARTER, 1965
(Kellogg Only)

June 25 Friday Registration of all students
June 28 Monday Classes begin for all students
July 5 Monday Last day to enroll for summer quarter
July 12 Monday Last day to add courses
September 3-4 Friday-Saturday Final examinations
September 4 Saturday End of summer quarter

TENTATIVE SUMMER QUARTER, 1965
(San Luis Obispo Only)

Four-week Term

June 28 Monday Registration of all students for both terms
June 29 Tuesday Classes begin for all students
July 23-24 Friday-Saturday Final examinations

Six-week Term

July 26 Monday Registration for six-week term only
July 27 Tuesday Classes begin for all students
September 2-3 Thursday-Friday Final examinations
September 3 Friday End of summer quarter

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ADMINISTRATION
Library Patio with Administration Building in Background
San Luis Obispo
ADMINISTRATION

TRUSTEES OF THE CALIFORNIA STATE COLLEGES

EX OFFICIO TRUSTEES

Edmund G. Brown, LL.B. .................................................. State Capitol, Sacramento
Governor of California and President of the Trustees

Glenn M. Anderson, A.B. .................................................. State Capitol, Sacramento
Lieutenant Governor of California

Jesse M. Unruh, B.A. ....................................................... State Capitol, Sacramento
Speaker of the Assembly

State Superintendent of Public Instruction

Glenn S. Dumke, A.B., M.A., Ph.D., LL.D., L.H.D. ................. 2930 W. Imperial Hwy.,
Chancellor of the California State Colleges

Inglewood

APPOINTED TRUSTEES

The term of the appointed trustees is eight years, and terms expire March 1 of
the years indicated in parentheses. Names are listed in order of original accession
to the board.

San Francisco 94104

Donald M. Hart, B.A. (1968) ............................................. 2230 Pine St., Bakersfield 93302


Paul Spencer, B.A. (1969) .................................................. P.O. Box 145, San Dimas 91773

Theodore Meriam, A.B. (1971) ......................................... P.O. Box 370, Chico 95927

Allen J. Sutherland, A.B. (1964) ...................................... 630 Rosecrans, San Diego 92101

Thomas L. Pitts (1966) ................................................... 995 Market St., Rm. 810, San Francisco 94103

9220 Sunset Blvd., Los Angeles 90046

Albert J. Ruffo, LL.B., B.S. in E.E. (1971) ......................... 1680 Hedding St., San Jose 95113

John E. Carr, B.A. (1965) ................................................... 611 Lido Park Dr., Newport Beach 92660

Mrs. Philip Conley, B.A. (1964) ........................................ 3729 Huntington Blvd., Fresno 93702

E. Guy Warren, B.A. (1965) .............................................. P.O. Box 59, Hayward 94541

Daniel H. Ridder, B.A. (1967) .......................................... Long Beach Independent Press Telegram,
604 Pine St., Long Beach 90801

George D. Hart, A.B. (1967) ............................................. 111 Sutter St., San Francisco 94104

Gregson E. Bautzer, B.A., LL.B. (1968) ......................... 190 N. Canon Dr., Beverly Hills 90069

George A. Thatcher (1970) ............................................... 10889 Wilshire Blvd., Suite 860,
Los Angeles 90024

OFFICERS OF THE TRUSTEES

Edmund G. Brown, Governor ............................................ President

Charles Luckman ............................................................ Chairman

Albert J. Ruffo ............................................................. Vice Chairman

Glenn S. Dumke, Chancellor ........................................... and Secretary-Treasurer

[ II ]
California State Polytechnic College

OFFICE OF THE CHANCELLOR OF THE CALIFORNIA STATE COLLEGES
2930 West Imperial Highway, Inglewood, California, 90303

Chancellor: Glenn S. Dumke
Vice Chancellor, Academic Affairs: Raymond A. Rydell
Vice Chancellor, Business Affairs: John F. Richardson
Assistant Chancellor, Faculty and Staff Affairs: C. Mansel Keene

COLLEGE ADMINISTRATION

President: Julian A. McPhee
Secretary to the President: Leona M. Boerman
Vice President: Robert E. Kennedy
Executive Dean, Operations Analysis: Harold O. Wilson
Executive Dean, Planning and Development: Hugh La Bounty
Foundation Manager: Eugene E. Brendlin
Publications Manager: Douglass W. Miller

SAN LUIS OBISPO CAMPUS

Dean of the College: Dale W. Andrews
Dean of Students: Everett M. Chandler
Dean, Applied Arts Division: Carl C. Cummins
Dean, Applied Sciences Division: Clyde P. Fisher
Dean, Engineering Division: Harold P. Hayes
Registrar: Jerald F. Holley
Associate Dean (Activities): John D. Lawson
College Physician: Billy W. Mounts
Business Manager: Donald S. Nelson
Placement Officer: Eugene Rittenhouse
Dean, Agriculture Division: J. D. Lawson
Associate Dean (Counseling and Testing): Joics B. Stone
Assistant to the President: Howard West
Associate Dean (Admissions and Records): C. Paul Winner

KELLOGG CAMPUS

Dean of the College: C. O. McCorkle
Associate Dean (Counseling and Testing): Albert J. Aschenbrenner
Dean, Agriculture Division: Carl R. Englund
College Physician: Laureen J. Henderson
Associate Dean (Activities): Henry House
Business Manager: Cecil W. Jones
Assistant to the President and Director, Voorhis Educational Center: Kenneth Kitch
Dean, Arts and Sciences Division: Thomas H. McGrath
Associate Dean (Women): Robert L. Maurer
Dean, Engineering Division: Mary Etta Murray
Placement Officer: Harold P. Skamser
Registrar: Milton R. White
Associate Dean (Admissions and Records): Robert J. Winterbourne
Business Manager: Richard G. York
THE CALIFORNIA STATE COLLEGES

San Jose State College  Dr. John T. Wahiquist, President
San Jose, California  95114

Chico State College  Dr. Glenn Kendall, President
First and Normal Streets, Chico, California  95927

San Diego State College  Dr. Malcolm A. Love, President
5402 College Avenue, San Diego, California  92115

San Francisco State College  Dr. Paul A. Dodd, President
1600 Holloway Avenue, San Francisco, California  94132

California State Polytechnic College  Dr. Julian A. McPhee, President
San Luis Obispo campus, San Luis Obispo, California  93402

Fresno State College  Dr. Arnold E. Joyal, President
Shaw and Cedar Avenues, Fresno, California  93726

Humboldt State College  Dr. Cornelius H. Siemens, President
Arcata, California  95521

Los Angeles State College  Dr. Franklyn A. Johnson, President
5151 State College Drive, Los Angeles, California  90032

Sacramento State College  Dr. Guy A. West, President
6000 Jay Street, Sacramento, California  95819

California State Polytechnic College  Dr. Julian A. McPhee, President
Kellogg-Voorhis campus, Pomona, California  91766

Long Beach State College  Dr. Carl W. McIntosh, President
6101 East 7th Street, Long Beach, California  90804

Orange State College  Dr. William B. Langsdorf, President
800 State College Boulevard, Fullerton, California  92631

California State College at Hayward  Dr. Fred F. Harcleroad, President
25800 Hilary Road, Hayward, California  94542

San Fernando Valley State College  Dr. Ralph Prator, President
18111 Nordhoff Avenue, Northridge, California

Stanislaus State College  Dr. Alexander Capurso, President
P.O. Box 1000, Turlock, California  95380

Sonoma State College  Dr. Ambrose R. Nichols, Jr., President
265 College View Drive, Cotati, California  94928

California State College at Palos Verdes  Dr. Leo F. Cain, President
Mailing Address: 2930 West Imperial Highway, Inglewood, California  90303

California State College at San Bernardino  Dr. John M. Pfau, President
Mailing Address: 532 Mountain View Avenue, San Bernardino, California  92407

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GENERAL INFORMATION

THE CALIFORNIA STATE COLLEGES

The California State Colleges are a unique development of the democratic concept of tax-supported public higher education for all qualified students. Spanning the state from Humboldt County in the north to San Diego in the south, the 16 campuses of the California State Colleges (with two additional campuses in the planning stage) represent the largest system of public higher education in the Western Hemisphere and one of the largest in the world. Current enrollment is more than 135,000 full- and part-time students. The faculty and administrative staff number some 7,000.

The California State Colleges are dedicated to rigorous academic standards. Constant striving for academic excellence is at the heart of the system. Each faculty within the system is a "teaching faculty" whose primary responsibility is the instructional process on the teacher-student level, with appropriate recognition of the necessary and constructive role of research in any institution of higher education.

Responsibility for the California State Colleges is vested in the Board of Trustees, which is appointed by the Governor, and the Board's administrative arm, the Chancellor. The Trustees and the Chancellor set broad policy for the colleges while delegating considerable independent responsibility for implementation at the college level.

Although the oldest of the colleges, San Jose State College, dates back a century, the California State College system under an independent Board of Trustees was created by the Donahoe Act of 1960. Formerly, the colleges were under the jurisdiction of the State Board of Education.

Today, the California State Colleges are in a particularly dynamic period of their development. Prior to World War II, there were seven State Colleges with a peak total enrollment of some 13,000. Since 1947, nine new campuses have been developed and two more are scheduled to begin operation within the next three years. Enrollment in the system is expected to reach 180,000 by 1970.

AIMS OF CALIFORNIA STATE POLYTECHNIC COLLEGE

California State Polytechnic College provides occupationally centered education at the college level with emphasis on the applied fields of agriculture, engineering, business, and home economics, together with the closely related supporting fields of physical sciences, natural sciences and mathematics. A program of required general education courses and a strong co-curricular program combine with the college's specialized instruction to prepare graduates for citizenship, leadership, and constructive community living.

The basic purpose of the college is to prepare students to meet both present and future requirements of specific occupations in production, supervision, management, product design and development, sales, services, and similar areas. Instruction is specific and practical—it adds the "know-how" to the "know-why." Each year of study is planned to include basic technical courses with related work in the early years laying the foundation for more advanced study in the area of the major. Requirements of the occupation, rather than of professional graduate schools, determine the educational experiences offered to each student. Laboratory experiences and field work with constant interplay between general principles and practical applications are emphasized. Many students obtain actual managerial experience through the use of the project system of instruction which the college utilizes.

To make maximum use of the student's interest in his field of specialization as an incentive to study, work in his chosen field is begun in the freshman year. This
concurrent or parallel arrangement of major and general education courses is in contrast to the conventional college program which groups general education courses and basic theory in the first two years while deferring the more specialized work until the last two years. Through early contact with his major subject, the student may be made aware of the value of the related sciences and may, therefore, apply himself more diligently to their study.

The general education courses and the related courses which support the occupational instruction are offered in each of the four college years. This plan makes it possible to schedule in the later college years those courses with content which requires greater maturity and experience. Students thus have a better opportunity to understand what they are studying and to obtain maximum values in general education.

California State Polytechnic College accepts responsibility not only for the occupational education of its students but also for helping them to obtain the best possible career opportunities through its placement service.

HISTORY

California State Polytechnic College was established in 1901 by the Legislature of the State of California. The college was built just outside San Luis Obispo midway between San Francisco and Los Angeles, at the foot of the Santa Lucia mountain range, 12 miles from the Pacific Ocean, on a campus which has been gradually augmented to its present 2,850 acres.

The institution opened as a state vocational high school and, in California, was the forerunner of vocational education in agriculture and industry. In 1921 its Board of Trustees was dissolved and the State Board of Education took over this school which it controlled until its administration passed to the Trustees of the California State Colleges July 1, 1962.

The level of instruction was raised in 1927 to that of a junior college. Cal Poly changed to a two-year and three-year technical college in 1933. A degree transfer program was added in 1936, and in 1940 the State Board of Education authorized the college to grant the bachelor of science degree for completion of the four-year curriculum.

The first baccalaureate exercises were held in 1942. The college was approved on October 1, 1949, to grant the master of arts degree in education.

Originally coeducational, the college discontinued the enrollment of women in 1929. Enrollment of women as regular students was resumed at San Luis Obispo in 1956.

In 1938, a completely equipped school and farm of 157 acres near San Dimas in Los Angeles County, was deeded to California State Polytechnic College by its owners, Charles B. Voorhis of Pasadena, and his son, former Congressman Jerry Voorhis. Admirably situated and adaptable for technical instruction in citriculture, deciduous fruit production, agricultural inspection and landscape gardening, this campus was immediately put to use as a plant industries branch of the college. Although it was necessary to close the Voorhis Unit during the war period, 1942-45, it was reopened in the fall of 1945 and instruction was continued until it was moved to the Kellogg Campus following the completion there of the Science Building in 1956. In 1961, the Voorhis Unit became the home of Cal Poly's new Educational Center devoted to workshops, conferences, seminars, etc.

The Kellogg Campus, which consists of 816 acres just outside of Pomona, was given to the California State Polytechnic College in 1949 by the W. K. Kellogg Foundation of Battle Creek, Michigan. It was founded by W. K. Kellogg in 1925 as the Kellogg Arabian Horse Ranch and became famous as one of the outstanding Arabian horse breeding farms in the world. This property was deeded to the State to be used for occupational training consistent with the philosophy and educational objectives of California State Polytechnic College. A condition of the deed provides that the college maintain an Arabian horse breeding program.

Beginning with the Science Building in 1956 the State of California has developed a new college facility on the Kellogg Campus at a cost to date of more than $25,000,000. The major instructional operation of the college's southern branch is now carried on at the Kellogg Campus which now offers not only an expanded agricultural program but also majors in engineering, business, and arts and sciences. Coeds were admitted for the first time in the fall of 1961.
ACCREDITATION

The college is fully approved as a four-year degree-granting institution by the Northwest Association of Secondary and Higher Schools, and the Western Association of Schools and Colleges (formerly Western College Association).

THE FOUNDATION

The college's unique project system of "learning by doing" and "earning while learning" has been progressively developing since 1924. At that time, projects were organized on a small scale and were financed by the Citizen's State Bank. Faculty members and parents backed this arrangement for the protection of the bank. Several years later, a faculty committee assumed the responsibility for operating the housing facilities and a cafeteria. In 1940 a nonprofit corporation known as the California State Polytechnic College Foundation was organized. With faculty members as directors, the foundation has assumed the responsibility for financing and recording the project operations, operating and managing the cafeterias and housing facilities, and providing other services to students.

The foundation, at both campuses, operates under lease agreements made with the Trustees of the California State Colleges and approved by the State Department of Finance. The provisions of these leases define the activities of the foundation and the use of its funds. The accounts are audited by the Department of Finance.

Through the foundation there is available an $80,000 revolving fund from which students may borrow to finance their projects. No cosigner is required for a student to borrow from the foundation, but he must present a working plan, a budget, and a signed contract with the foundation before starting a project. Each student contributes a share from his earnings towards the project fund. Any losses in student projects are covered by the foundation from the fund contributed by project operators.

Typical agricultural projects include: Fattening steers, lambs, or swine; raising and breeding cattle, both beef and dairy, for a start towards future herds; growing crop projects, such as tomatoes, sweet corn, hay, and sugar beets; raising poultry, both meat birds and laying hens, and operating the hatchery; growing and marketing ornamental horticulture projects.

Engineering departments also conduct group projects.

THE ALUMNI ASSOCIATION

Affairs of the association are under the supervision of a Board of Directors, consisting of the national president, national vice president, national secretary-treasurer of the association, the president of each region, the past national president of the association and two ex officio members appointed by the president of the college.

The California State Polytechnic College at San Luis Obispo is the official headquarters of the association and inquiries may be addressed there to obtain information relative to membership and other matters pertinent to the association for both of the campuses.

The California State Polytechnic College Alumni Association is divided into ten geographic regions with a president for each region. These regions are:

Central, comprising Calaveras, Alpine, Amador, Sacramento, San Joaquin, Solano, Yolo, El Dorado, Mono, Mariposa, Merced, Stanislaus, and Tuolumne Counties.
Golden Gate, comprising Marin, Contra Costa, Alameda, San Francisco, and San Mateo Counties.
Hawaiian Islands, comprising all the islands constituting the State of Hawaii.
Los Angeles, comprising Los Angeles County.
North Coast, comprising Napa, Sonoma, Lake, Mendocino, Del Norte, and Humboldt Counties.
Region at Large, comprising the 48 other states, and other countries.

Sacramento Valley, comprising Placer, Sutter, Colusa, Yuba, Nevada, Sierra, Butte, Glenn, Tehama, Plumas, Lassen, Shasta, Modoc, Siskiyou, and Trinity Counties.

San Joaquin Valley, comprising Kern, Kings, Fresno, Tulare, and Madera Counties.

South Coast, comprising Santa Cruz, Santa Clara, San Benito, Monterey, and San Luis Obispo Counties.

Southern, comprising Santa Barbara, Ventura, San Bernardino, Riverside, Orange, Imperial, San Diego, and Inyo Counties.

SPECIAL INSTRUCTIONAL SERVICES
SERVICES TO VOCATIONAL AGRICULTURE

Services to vocational agriculture departments in the secondary schools of California are provided by the college 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 by the college through a co-operative arrangement with the Bureau of Agricultural Education, some offices of which are located on the campus.

SHORT COURSE AND WORKSHOP PROGRAMS

The college makes its facilities and instructional staff at both its Kellogg and its San Luis Obispo Campus available for a number of professional short courses, workshop programs, and conferences such as: Physical Education Workshop, California Nurserymen's Refresher Course, California Hereford Breeders Association, Livestock Judging Conference, Soil Conservation Service Special Courses, California Conference on Science and Mathematics in Public Schools, Grange Youth Conference, American Association of Physics Teachers, FFA Conference, Southern California Arabian Association, Junior Engineer Technical Society, Southern California Botanist's Association, Turf Grass Association, and American Society of Tool and Manufacturing Engineers meeting.

Educational Center

The Educational Center at the Voorhis Unit serves groups from business, industry, agriculture, education, government and professional organizations for conferences, workshops, seminars, institutes, training programs and creative retreats. The Center is able to accept in-residence groups up to 127 and day groups up to 175. The groups which it is serving represent local, regional, statewide, west coast and national areas.

OVERSEAS STUDY PROGRAMS

California State Polytechnic College students who qualify may participate in overseas study programs of the California State Colleges. Students may undertake a full academic year at major institutions of higher learning in Asia, Europe and Latin America. Academic work successfully completed at the cooperative universities abroad may be applied toward degree requirements with the approval of the students' major advisers and in accordance with college regulations. Detailed information may be obtained at the office of the Dean of Students or by writing to the Office of International Programs, 1600 Holloway Avenue, San Francisco California 94132.
ADMISSIONS

Admission to California State Polytechnic College is open to qualified graduates of any high school and to other applicants who, in the judgment of the appropriate college authorities, possess equivalent preparation. Admission is limited to those students for whom adequate staff and facilities are available.

Guidance tests which are completed by incoming students are a part of the registration procedure and are given for the purpose of providing information for the student, his departmental adviser, and the counseling center. The departmental adviser uses guidance test results to assist in determining the courses most suited to the student's needs. These tests are not entrance examinations.

New students who have not completed one or more appropriate college degree courses in English or mathematics are required to take the English placement test and the mathematics placement test.

At the time of admission to the college all students are accepted into a specific major field of study. To conform to admission requirements, every student must submit an application for admission and transcripts of previous high school and college training, including available test data. See also under "Matriculation."

Transcripts and records presented for admission or evaluation will remain in the student's folder as a part of his permanent record upon completion of registration.

Transfer Credit and Residence Requirements

Persons who have attended junior colleges or four-year colleges will be given full credit for such college level courses as may be applicable to the pattern of course work in the California State Polytechnic College curriculum followed, and in general elective credit for those not so applicable.

No more than 70 semester units (105 quarter units) may be allowed for credit taken in a junior college. No credit may be allowed for professional courses in education taken in a junior college.

No limit is placed upon the number of transferable credits from a four-year college or university, except that no student will be granted a bachelor of science degree in any of the various curricula with less than three full quarters of residence, two of which immediately precede graduation, nor with less than 50 quarter units of work received in residence at California State Polytechnic College.

Individuals transferring from colleges or universities will be considered for admission only on a conditional basis at California State Polytechnic College if they have been on probation at the college or university last attended.

Evaluation of in-service military training will be made on the basis of American Council on Education recommendations.

REQUIREMENTS FOR ADMISSION AS AN UNDERGRADUATE STUDENT

Admissions standards in the California State Colleges are prescribed by the Trustees of the California State Colleges and are stated in the California Administrative Code, Title 5, Education,* which provides a uniform pattern of admissions regulations for all the colleges.

The California State Colleges will change admission requirements for entering freshmen in the Fall of 1965. High school students who are planning to apply for admission to a state college at that time should consult with their high school counselors about the new freshmen admission standards during the 1964-65 academic year. Counselors will be informed of these new requirements and all developments concerning them as the year goes on.

* Sections 40600-41200.
FRESHMAN ADMISSION

A high school graduate must meet one of the following requirements, (a) or (b). All freshmen applicants must also complete the required aptitude test in order that their applications be considered. Applicants for admission to the San Luis Obispo Campus should complete and submit the results of the College Entrance Examination Board Scholastic Aptitude Test (SAT). Applicants to the Kellogg Campus should complete and submit the results of the American College Testing Program Test (ACT).

(a) The applicant must have earned 14 or more semester grades of A or B in subjects, taken during the last three years of high school, other than physical education, military science and remedial courses. Six of the 14 grades must be in college preparatory subjects selected from one or more of the following fields (no specific course pattern is required):

1. English, including speech, drama, and journalism, other than activity courses.
2. Foreign languages.
4. Natural sciences.
5. Social sciences.

(b) The applicant must have earned 10 or more semester grades of A or B in subjects, taken during the last three years of high school, other than physical education, military science, and remedial courses, and have achieved a score at or above the thirtieth percentile on national college freshmen norms of a college aptitude test.

ADULT SPECIAL STUDENTS

An applicant who has attained the age of 21 years and is not a high school graduate may be admitted as an adult special student provided that he demonstrates to the proper college authorities ability to profit from college work.

STUDENTS REGISTERED FOR SIX UNITS OR LESS

Students registered for six units or less are subject to the same admission requirements as regular students. See also under “Matriculation.”

ADMISSION TO ADVANCED STANDING

An applicant who meets the requirements for freshman admission who has earned credit in one or more accredited junior colleges, colleges, or universities may be admitted if he has a grade point average of 2.0 (grade C on a five-point scale) or better in the total program attempted at such colleges or universities and is in good standing at the last college or university attended.

An applicant who does not meet the requirements for admission with freshman standing must as a condition for admission have earned 60 or more semester units of college credit with a grade point average of 2.0 or better in the total program attempted and must be in good standing as noted above.

Applicants With Particular Majors

An applicant who was ineligible for freshman admission may be admitted if his major is such that 60 semester units of work appropriate to state college degree requirements in the particular major are not offered by the accredited degree-granting institution from which he seeks to transfer, and if he meets all of the following standards:

1. He has earned college credit in one or more accredited degree-granting colleges or universities and attained a grade point average of 2.0 (grade of C on a five-point scale) or better in the total program attempted at such colleges or universities.
2. He was in good standing at the last accredited college or university attended.
3. In the opinion of the proper college authorities, he can succeed in the major in the state college.
General Information

Other Applicants

An applicant who does not meet the requirements set forth above is eligible for admission with advanced undergraduate standing on a conditional basis if in the opinion of the proper college authorities he can succeed in college.

ADMISSION FROM SCHOOLS AND COLLEGES IN FOREIGN COUNTRIES

The official transcript of record and other credentials of an applicant for admission from a foreign country should be submitted in official English language translation. They will be evaluated under the general regulations governing other admissions. All application papers should be submitted to the Admissions Office at least three months before the opening of the quarter in which the applicant hopes to gain admittance. This early application is designed to allow sufficient time for the necessary correspondence relative to entrance and, if the applicant is admitted, will aid him in obtaining the necessary travel documents.

An applicant from a foreign country whose education has not been conducted in the English language may be admitted only after demonstrating that his command of the language will permit him to profit from instruction in this college. An applicant may be asked to take an English language test in his own country or one administered by the college.

INTERCAMPUS TRANSFER

An undergraduate student who has attended one or more quarters at either the San Luis Obispo or the Kellogg campus may apply for transfer to the other campus without payment of an additional application fee provided (1) he has not since been registered in a regular session in another institution, and (2) he has been enrolled at either campus during one or more of the three quarters immediately preceding the quarter for which application is being made. The proper forms to effect such a transfer may be obtained from the Registrar or Admissions Office. These forms must be filed with that office at least two weeks prior to the effective date of transfer.

REQUIREMENTS FOR ADMISSION AS A GRADUATE STUDENT

All students desiring to do graduate work must file for admission at the Admissions Office. This applies not only to graduates of other colleges, but to students at the California State Polytechnic College. Graduates of this college must reapply for admission as graduate students.

A graduate of this college or of another four-year institution having substantially the same requirements for the baccalaureate degree is eligible to apply to the Admissions Office for admission as a graduate student. Admission does not imply that the student is accepted as a candidate for the master's degree or for an institutional recommendation for a credential, but it does place him on graduate standing and authorizes him to take graduate work for which he is otherwise eligible.
EVALUATION FOR ADMISSION TO GRADUATE STANDING

For purposes of evaluation, applications must be accompanied by a copy of all official transcripts of previous college work. Such evaluation should be accomplished through correspondence prior to registration.

Applicants who wish to become candidates for the master's degree must, following admission to graduate standing, file an application for tentative candidacy for the degree. The form for this application may be obtained from the Co-ordinator of Graduate Studies. The Graduate Study Committee must have accepted the application for tentative candidacy for the master's degree before graduate work may be applied to degree requirements.

Admission to full graduate standing may be denied on the basis of: (1) undergraduate scholarship average below 2.0 (2) graduation from a nonaccredited college, (3) completion of a four-year program not considered comparable to the bachelor of science degree.

GRADUATE COURSES TAKEN BY UNDERGRADUATES

Undergraduates who are within 12 quarter units of graduation may petition to use up to 9 quarter units of work in 400 or 500 series courses as graduate credit, when such courses are not required in order to receive the baccalaureate degree. Certain 300 series courses may be approved for graduate credit on petition to the Coordinator of Graduate Studies.

ADMISSION FROM A NONACCRREDITED COLLEGE

Provisional admission to graduate study may be granted to one who holds a bachelor's degree from a nonaccredited college. Such a student will be eligible for full graduate standing when he has completed 12 units of upper division or graduate work with a grade point average of 3.0 and has removed such baccalaureate deficiencies as may have existed.

ADMISSION FOR THOSE NOT YET CLEARED FOR GRADUATE STANDING

Provisional graduate standing will be granted to those applicants for graduate standing who have not yet been cleared at the time the college opens and courses start. Such candidates enter graduate work at their own risk, since no candidate may use such work for the master's degree unless he is later placed on full graduate standing.

ADMISSION TO GRADUATE COURSES

To be admitted to graduate courses a student must have graduate standing (either provisional or full) and, unless he has an undergraduate major in the field, have permission of the instructor of the course. Candidates are referred to the specific course descriptions, since in some cases the permission of the department head or division dean may be specified.
GENERAL REGULATIONS

MATRICULATION

Matriculation refers to the complete process of being admitted to the college as a candidate for a certificate, degree, or credential and requires that the student who applies for admission as an undergraduate present a completed application for admission and transcripts of his previous academic training including transcripts from high school and/or college. Applicants for admission as graduate students must present satisfactory evidence of their qualifications to enroll—usually a transcript certifying graduation from an accredited college or university.

All students must complete the matriculation process.

REGISTRATION PROCEDURE

All students must complete Form SC-50, Statement of Residence, in advance so that their residence status can be determined prior to registration.

All students are required to register as majors in a specific department of the college.

The schedule for registration and payment of fees is published in the “Class Schedule and Instructions for Registration” which is issued prior to the start of the academic year. Students should consult this booklet for detailed registration procedures.

Credit for course work completed is given only when the student is properly registered. A student is not properly registered unless his completed quarter registration forms, listing the program approved by his adviser, are on file in the Registrar’s Office. Individuals are not admitted to courses unless they are registered as students at the college.

CHANGE OF 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 are encouraged to transfer to another curriculum as soon as the condition becomes apparent. Students should contact their adviser and the college Counseling Center for assistance in making curriculum changes. Approval by the Veterans Administration must be obtained by students enrolled under certain laws before the major curriculum can be changed.

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

Upon transfer from a degree to a technical curriculum, at the San Luis Obispo 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

While in continuous attendance, a student is not held for courses added to a curriculum in quarters which he has completed. However, a student shall meet all changes in curriculum requirements affecting quarters which he has not completed. The determination of a student's standing, in reference to quarters completed, will be computed upon the basis of the number of units remaining to be completed in the student's selected curriculum.

CURRICULUM DEVIATION

Although the college has specified a curriculum 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 Registrar's Office.

CHANGE OF PROGRAM

The student is held responsible for every course appearing on his official program card. Each change must be made on or before the applicable last date as published in the academic calendar and must be filed with the Registrar's Office on the proper form.

Changes which must be made on or before the last day to add courses include adding a class, increasing units in a course, changing from audit to credit. Changes which must be made on or before the last day for dropping classes without penalty include dropping a class (no penalty), reducing units in a course, changing a section of a course, changing from credit to audit. Forms for the change of program may be obtained from the Registrar's Office.

The last day to drop classes without penalty during the regular quarters is the 14th calendar day following the day on which classes begin. After this day a student may withdraw from a course in which he is enrolled for credit only by accepting a grade based upon his standing in the course at the time of withdrawal. The instructor will indicate on the form whether the student is to receive a grade of F (failure) or W ( withdrew) for the course. The grade of W indicates that the student is passing (Grade A to D) in the course at the time of withdrawal. Except for college recognized emergencies, no withdrawals from a course will be permitted after the end of the seventh week of instruction.

Students who withdraw from college prior to the end of the quarter will receive a W or an F grade in each course depending upon whether passing or failing work has been accomplished up to the time of withdrawal.

ACADEMIC OBLIGATIONS

Each student enrolled at California State Polytechnic College is enjoined to pursue aggressively the course of study which he has undertaken, in order that both he 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.

An instructor, with the President's approval, may at any time exclude from his course any student guilty of unbecoming or disorderly conduct toward the instructor or the class. A student thus excluded will be recorded as having failed in that course unless the college determines otherwise.
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 a serious offense, and no excuses for work missed are provided.

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 in no way excuses him from the work required.

MINIMUM GRADE REQUIREMENTS

A student will be subject to disqualification under either of the following conditions:

1. If the student's cumulative grade point average is less than 2.0 (C).
2. If the student's grade point average is less than 2.0 (C) for each of his last two consecutive regular quarters in attendance.

Preparatory course units, grades, and grade points will not be counted in determining the cumulative grade point average. Grades below "C" received in preparatory courses will be considered in determining academic disqualification.

A student who is disqualified will be so notified.

A student who is disqualified for failure to maintain satisfactory academic progress will not be readmitted until at least one regular quarter has elapsed and then only after presentation to the college of satisfactory evidence that he has improved his chances of scholastic success. The request for readmission will be referred to the dean of the division in which the student wishes to enroll.

GRADING SYSTEM

The following grading system is in effect:

A—Superior
B—Better than average
C—Average
D— Barely passing
E—Incomplete
F—Failure
P—Passing (workshops only)
W—Withdrew from course without failure
WF—Withdrew from course failing

Grade points are assigned to the various grades (except grade P) as follows:

For each unit of Grade A—4 points
For each unit of Grade B—3 points
For each unit of Grade C—2 points
For each unit of Grade D—1 point
For each unit of Grade E—0 point
For each unit of Grade F—0 point

Passing grades are marked A, B, C, D. Grade E (incomplete) indicates a record below passing. It can be made up or completed without repeating the course in class by examination, or completing all unfinished work, or both, as the instructor may determine. The removal of grade E entitles the student to the number of grade points to which he may be entitled for his passing grade.

Grade E may be given to a student for the following reasons:

1. Passing in classwork, but final examination not taken.
2. Passing in classwork completed and in final examination, but some assigned work not completed.
A grade of E must be made up to a passing grade within one year. In the event this is not done, the course must be retaken.

A student may repeat a course in which he has received a grade lower than C under the following condition: Each time the course is taken the student will be charged with units attempted and will receive the grade points earned. Unit credit is given only once for a repeated course and is recorded the first time the course is passed.

Except where noted in the specific course description, a student may not enroll in (except as an auditor) or receive credit by examination for any course in which he has received a grade of C or higher.

Students may have grades sent to them by leaving self-addressed stamped envelopes in the Registrar’s Office at the end of the quarter; otherwise, grades will be sent to students through their campus mail boxes.

**MAXIMUM AND MINIMUM 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 division dean and completion of a petition to carry excess load. Regular credit will not be given for a course completed in any quarter unless the course appears on the student’s approved program card for that quarter. 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.

Veterans enrolled under Public Law 550 must enroll for a minimum of 14 units to receive full monthly payments.

**HOLDING OF RECORDS**

Student records may be placed in a “Hold” status because of financial or other obligations to the college. While the student’s records are so held, he will not be issued a “permit to register” nor will transcripts of his credits be released to anyone. The student’s records will be held until the obligation is cleared to the satisfaction of the office or department placing the “Hold.”

**HONORS (PRESIDENT’S LIST)**

The “President's List” is published annually to honor those students who have earned a 3.0 grade point average in all their studies taken at the college. Students, to be considered for the President's List, must have been enrolled for at least twelve units each regular quarter.

“Graduation with Honors” is awarded to those graduates who have accumulated a 3.1 grade point average or better including all college level work taken at the college and credit transferred from other colleges.

**TRANSFER TO OTHER COLLEGES**

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

A student enrolled either as a regular or limited student may be permitted, at the discretion of his division dean, 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 fee of $1 per unit is charged for such an examination. It 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. A student is not permitted to obtain credit by examination in a course unless all prerequisites for the course as specified in this catalog have been satisfied. The grade received is entered on the student's permanent record. The length of the examination will be consistent with the unit value of the course.

When a re-examination is requested for a course, a six-week period must elapse before a petition for credit by examination will be considered.

Units of credit received through this procedure may not apply toward the residence requirements for any of the degrees or credentials offered by the college.

Detailed instructions for applying for credit by examination may be obtained from the Registrar's Office.

AUDITING OF COURSES

An auditor is a student who is attending courses for no credit. He must be registered with fees paid for the quarter in which the course he desires to audit is offered. Audited courses must be included on the student's study list with the designation "AUD" in the "units" column along with the number of units. A student may enroll to audit a course during the first week of instruction and no later than the last 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.

The materials and service fee is determined on the basis of the total units for which the student is enrolled including courses audited.

CREDIT FOR MILITARY SERVICE

1. 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.

2. In addition to the nine quarter units under 1, 13½ quarter units of elective credit will be allowed toward graduation to any student submitting evidence that he has received a commission in the Army, Navy, Air Force, Coast Guard, or Marine Corps. Maximum total credit possible toward graduation for military service is 22½ quarter units. Credit is not given for completion of the six-month Reserve Training Programs or for college level General Educational Development Tests.

3. In allowing for credit for inservice training, California State Polytechnic College follows the recommendations of the American Council on Education in terms of units allowed and subject matter covered.

ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS

Eligibility for competition in intercollegiate athletics by students attending either the San Luis Obispo Campus or the Kellogg Campus is regulated in general by the
rules of the National Collegiate Athletic Association and specifically by the following college regulations:

1. Competition on a varsity team is open to a student in regular standing in a degree curriculum who, during the season of competition, is carrying at least 12 quarter units selected to provide substantial progress toward his educational objective.

2. The student must have at the beginning of his competition in any sport at least a "C" (2.0) cumulative grade point average in all college work attempted.

3. The student must have passed a minimum of 36 quarter units between seasons of competition.

4. Freshmen are not eligible for varsity competition in football, basketball, baseball, or track.

5. Transfer students from four-year colleges in order to be eligible must have a calendar year of residence at the campus where they will participate.

6. Junior college transfers are immediately eligible for varsity competition if they are regularly admitted to a degree program and have a 2.0 cumulative grade point average in all college work attempted. Transfers with one year of junior college competition in a sport are permitted three years of varsity competition in that sport. Transfers with two years of junior college competition are permitted two years of varsity competition.

HONORABLE DISMISSAL

Honorable dismissal automatically will be noted on the transcript of each student who graduates or withdraws from the college, unless he has been disqualified because of misconduct.

STUDENT CONDUCT

It is expected that all California State Polytechnic 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 the college are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is purely voluntary, and any student may withdraw from it at any time that he considers the obligations of membership disproportionate to the benefits. While enrolled, students are subject to college authority which includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher learning.

PROBATION, SUSPENSION, OR EXPULSION

In general, the college expects its students to conduct themselves as mature young men and women.

Any student may be placed on probation, suspended, or expelled for one or more of the following causes:

(a) Disorderly, unethical, vicious, or immoral conduct.

(b) Misuse, abuse, theft, or destruction of state property.

Among the specific causes for which the college will take such disciplinary actions are: the bringing or drinking of alcoholic beverages on campus; being intoxicated on campus; being arrested for cause by a public law enforcement agency; repeated minor violations of college rules and regulations, including those pertaining to driving and parking of vehicles.

The period for which the student may be placed on probation or suspended shall not exceed 12 months. No fees or tuition paid by or for such student for the quarter or summer term in which he is suspended shall be refunded. If the student is readmitted before the close of the quarter or summer term in which he is suspended, no additional tuition or fees shall be required of the student on account of his suspension.
COURSE NUMBERING SYSTEM

The numbering system used is a three-digit system. Courses are grouped first into number series indicating the college level at which they are normally taught as follows:

1-9—Preparatory courses
100-199—Freshman courses
200-299—Sophomore courses
300-399—Junior courses
400-499—Senior courses
500-599—Graduate courses
600-699—Professional courses

The first digit indicates the level or year in which the courses are normally taught. The second digit indicates the type of course with numbers assigned as follows:

0 or 1—Lecture courses
2 or 3—Courses involving both lecture and laboratory
4 or 5—Courses composed entirely of laboratory work
6 or 7—Senior project or seminar
8 or 9—Graduate thesis or seminar

The third digit indicates the quarter in which the course is normally taught.

1, 4 or 7—Fall quarter course
2, 5 or 8—Winter quarter course
3, 6 or 9—Spring quarter course

Note: Courses numbered 1-9 carry no credit toward meeting degree requirements in any of the curricula. Courses numbered 300-499 may be used for graduate credit with permission of the Coordinator of Graduate Studies. Courses numbered 600-699 are for professional advancement within a special field. The courses do not carry credit for degree requirements in any of the curricula.
DEGREES

Curricula leading to graduation with the degree of bachelor of science are offered at both campuses of California State Polytechnic College. In addition there are offered at the San Luis Obispo Campus programs leading to the two-year technical certificate in agriculture, to the degrees of bachelor of education and master of arts in education, and to teaching credentials authorizing service in the public schools.

The occupational majors in agriculture, engineering, applied arts and applied sciences are listed under the respective division in the two sections of this catalog. Requirements for teaching credentials are listed under the heading “Preparation for Elementary and Secondary School Teaching.”

APPLICATION FOR GRADUATION

Students shall make application for graduation in the Recorder’s Office prior to the last date for filing such applications, as shown in the college calendar.

DOUBLE MAJORS

The student will normally meet graduation requirements for a degree in one of the major departments. It is permissible for a student to have two majors indicated on this degree if the complete requirements of both curricula have been met.

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.

BACHELOR OF SCIENCE DEGREE

GENERAL REQUIREMENTS FOR GRADUATION

All candidates for the bachelor of science degree shall have completed the requirements in one of the listed four-year curricula with a minimum “C” grade average for all units in the major, shall have spent not less than three quarters in residence (two quarters immediately preceding graduation), shall have earned not less than 50 quarter units in residence, and shall have earned a total number of grade points at least equal to twice the number of units attempted. Transfer students, in their work taken at this college, must earn a number of grade points at least equal to twice the number of units attempted at this college.

Candidates from the Engineering Division must present a minimum of 210 quarter units of credit for graduation. Candidates from the Agriculture Division (except agricultural engineering which requires 210 quarter units) and from the Applied Arts and Applied Sciences Divisions must present a minimum of 198 quarter units of credit for graduation.

REQUIRED GENERAL EDUCATION

All candidates for the bachelor of science degree shall have completed the following general education requirements:

Social Sciences (Minimum 15 Units—Maximum 21 Units) †

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<tr>
<th>Units</th>
<th>Courses</th>
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<tbody>
<tr>
<td>9</td>
<td>from AmCiv 301, 302, 303; Pol Sc 301; Hist 304, 305</td>
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<tr>
<td>6-12</td>
<td>from Ec 201, 202, 213, 304; 408, 413, 414; IR 311, 312; Hist 101, 102,</td>
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<td>103, 112; Geog. 308, 312, 315; Bus 301; Soc 105, 206; Soc Sc 101; Ant</td>
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<td>201, 301; Pol Sc 401; Actg 121, 131</td>
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†The minimum number of units specified must be taken in each category in order to meet the general education requirement. The maximum number of units in each category is the most that may be used to meet the general education requirement; but is not intended to limit the number of units of the listed courses required or elected beyond the 68 units.

2—14191 [33]
Natural Sciences (Minimum 15 Units—Maximum 24 Units)†
3-21 units of Life Sciences from Bio 101, 102, 103, 110, 115, 127, 128, 129, 145, 200, 213, 227, 228, 229, 303, 307, 321; Bact 221; Bot 116, 121, 122, 124, 125; Zoo 122, 131, 132, 134, 135, 234, 237; Ent 126
3-21 units of Physical Sciences from PSc 101, 102, 103, 209, 216, 329; Phys 121, 122, 123, 131, 132, 133, 204, 211; Chem 321, 322, 323, 324, 325, 326

Mathematics (Minimum 3 Units—Maximum 10 Units)†
3-10 units from Math 100, 101, 102, 103, 106, 108, 109, 112, 117, 118, 121, 122, 200, 205, 206, 207, 211

Literature, Philosophy, and Arts (Minimum 9 Units—Maximum 13 Units)†
2-13 units from Eng 110, 111, 201, 202, 203, 207, 211, 212, 213, 306, 311, 312, 313, 315, 403, 406
0-9 units from Phil 201, 202, 204, 205
0-4 units from courses in Fine and Practical Arts

Health and Physical Education (Minimum 5 Units—Maximum 5 Units)†
2 units from PE 107; 3 units from PE 141, 241

Psychology (Minimum 3 Units—Maximum 6 Units)†
3 units from Psy 202; 0-3 units from Psy 205, 223, 301, 304

Oral and Written Expression (Minimum 8 Units—Maximum 12 Units)†
6 units from Eng 104, 105
2-6 units from Eng 106, 216, 218, 219, 301; Sp 200, 201, 202, 203, 300

Additional Units in General Education (To Make 68 Units)
Additional units in general education chosen from the above listed courses to make a total of at least 68 units but not exceeding the maximum in any one category.

TWO-YEAR TECHNICAL CURRICULA
(San Luis Obispo)

REQUIREMENTS FOR GRADUATION
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.

THE MASTER OF ARTS DEGREE
(San Luis Obispo)

FIELDS OF CONCENTRATION
The California State Polytechnic College offers a master of arts degree in education with concentration in the fields listed below. The purpose of the graduate program is to serve teachers, or to prepare students for teaching. In making application for admission to a program leading to the master of arts degree the student indicates one of these fields of concentration, based on the undergraduate and teaching major:

1. Agriculture
2. Biological sciences
3. Education
4. Mathematics
5. Physical education
6. Physical sciences
7. Social sciences

† The minimum number of units specified must be taken in each category in order to meet the general education requirement. The maximum number of units in each category is the most that may be used to meet the general education requirement; but is not intended to limit the number of units of the listed courses required or elected beyond the 68 units.
ADMISSION TO CANDIDACY FOR THE
MASTER OF ARTS DEGREE

To be admitted to candidacy for a master's degree a student shall have full graduate standing and shall have met the following criteria:

1. The candidate must possess an acceptable baccalaureate degree from an accredited college or have made up such deficiencies as may have existed. As indicated in the section on Admissions a copy of all transcripts of previous work must be filed in the Admissions Office.

2. The candidate shall have achieved a minimum grade point average of at least 2.5 in all undergraduate work and 3.0 in all courses taken subsequent to admission to graduate standing. A candidate with less than a 2.5 grade point average in undergraduate work may submit a request for special consideration by the Graduate Study Committee for admission to candidacy after he has completed in residence 12 units of graduate work with a grade point average of at least 3.0.

3. The candidate must possess a valid regular day school service California credential other than an emergency or a provisional credential, or complete by the time of receiving the master's degree the requirements for such a credential. Under certain circumstances the requirements for the credential may be waived:
   a. For students who because of citizenship in a foreign country are ineligible for a California credential, but who are teachers or are preparing to teach in a foreign country.
   b. For teachers with a minimum of one year of teaching experience who hold a license to teach in another state, or
   c. For applicants preparing to teach in institutions not requiring teaching credentials provided that a minimum of 18 quarter units in professional education be included in their graduate year.

4. Applicants must complete 12 quarter units of work at the California State Polytechnic College with a minimum grade point average of 3.0 before being admitted to full candidacy. Applicants who fail to maintain this average will be warned and if the deficiency continues through a second quarter, will be rejected.

5. The applicant must receive the approval of the major department and of the Graduate Study Committee.

6. The candidate must meet such standards of character, emotional stability, and general competence as may be established by the Graduate Study Committee and evaluated by tests or other evidence.

7. The applicant must pass a health examination. The regular credential examination, if taken early enough and at this college, will satisfy this requirement.

GRADUATION REQUIREMENTS FOR THE MASTER OF ARTS DEGREE

1. There must be a satisfactory completion of the candidate's degree program as determined by the Graduate Study Committee and the candidate's committee.

2. The program of graduate work must be completed with a grade point average of 3.0. (Courses are acceptable for the master's degree program only if grades of "A," "B," or "C" have been received.)

3. There must be a total of 45 quarter units of work approved for graduate credit after the candidate has been accorded graduate standing. In general all 400 or 500 series courses will be accepted for graduate credit except where 500 series courses are specifically required. The candidate should consult his adviser concerning exceptions. Certain 300 series courses may be approved for graduate credit on petition to the Coordinator of Graduate Studies.
   a. At least 36 of the total 45 units must be taken at the California State Polytechnic College in residence. At least 18 of these units must be in 500 series (graduate) courses.
b. A minimum of 18 units must be in the candidate's area of concentration (major), including 3 units in curriculum and methods, and 9 additional units of graduate courses (500 series).

c. A minimum of 12 graduate units in Education is required, to be selected in conference with the student's adviser.

d. The candidate's adviser and his committee will indicate such additional courses as may be required to complete the minimum program of 45 units and to meet the student's needs.

e. Not more than 9 units of the graduate program shall be in directed teaching, extension courses, and transfer credit.

4. Candidates who are completing their credential pattern concurrently with the master's degree must complete the credential work before they will be granted the degree.

5. Comprehensive written and oral examinations are required of all candidates.

6. Candidates are required to complete one year of successful teaching before completing the work for the master's degree. Exception may be made to this requirement in the following situations: (1) a foreign student who cannot secure a credential; (2) students intending to teach on the college level, and who need the degree to enter the field; (3) other problem situations which may merit such an exception.
SAN LUIS OBISPO CAMPUS
SAN LUIS OBISPO CAMPUS

INTRODUCTION

The campus at San Luis Obispo on which operations began in the fall of 1903 following the establishment of Cal Poly in 1901 by the Legislature of the State of California offers students of the entire state opportunity to obtain occupational higher education in agriculture, engineering, applied arts and applied sciences.

Each of these divisions offers majors leading to the bachelor of science degree. The Agricultural Division also offers two-year technical curricula. Students satisfactorily completing these curricula receive technical certificates.

BUILDINGS AND EQUIPMENT

CLASSROOM AND LABORATORY BUILDINGS

Administration (new)

This new facility contains all the administrative service offices of the college.

Administration (present)

With the completion of the new Administration Building, the present facility will be further re-modeled to provide additional instructional and service areas for the Education and Business Departments. The lowest floor also contains facilities for Audio-Visual Production and Services and an Art Laboratory.

Aeronautical Engineering

An engine shop and laboratory; airframe shop, laboratory, and hangar; aeronautical laboratory are all adjacent to the college flight strip.

Agricultural Education

This building contains faculty offices and classrooms for the Education Department and facilities for the College Counseling and Testing Center.

Agricultural Engineering

Seven well equipped shops include instructional facilities for farm mechanics, farm machinery, hydrology, farm power, and rural electricity. Drafting rooms, classrooms, and staff offices are provided in a separate building. Storage and repairs are provided for in the adjacent Farm Shop.

Alan A. Erhart Agriculture

This new building contains nine modern agriculture laboratories including three for crops, three animal husbandry, one dairy, one ornamental horticulture, and one farm management; an accounting laboratory; 15 general purpose classrooms and offices for agriculture and social science instructors.

Air Conditioning and Refrigeration

Laboratories for the Air Conditioning and Refrigeration Engineering Department; design and drafting room; lecture rooms; offices; project rooms and departmental equipment repair facilities. A wing of this building houses laboratories, shops, and offices for the Metallurgical Engineering Department.

Athletic Facilities

Constructed in 1959, the men's gymnasium provides boxing, wrestling, and gymnasium in addition to the main floor which contains three full-length cross-court basketball courts and seats 4,000 persons for athletic contests. Handball and tennis courts are adjacent to the gymnasium, along with a large playfield area for
intramural sports and physical education classes. There is also a women's physical education building with ample space for minor sports and special women's physical education requirements. A heated indoor swimming pool is used both for physical education classes and for varsity water polo and swimming. The football stadium has permanent grandstands and bleachers seating 5,500 persons. There is also a spacious baseball field with permanent seating, and a track with a 220-yard straightaway.

**Engineering East**
This building includes laboratories for the Electronic and Electrical Engineering Departments; design and drafting rooms; materials laboratory; lecture rooms, offices, project rooms and departmental equipment repair rooms.

**Engineering West**
The largest building on the campus, this unit is a U-shaped multi-story structure housing the entire facilities for the Architectural Engineering Department, the Technical Arts Department, and also containing instructional laboratories for the Aeronautical, Mechanical and Metallurgical Engineering Departments.

**English**
Constructed as an annex to the Erhart Agriculture building, this wing includes eleven lecture rooms, a speech laboratory, and offices for the English Department.

**Food Processing**
The college creamery, meat laboratory, canning and freezing laboratory for the college's Food Processing Department, and a new college produce store are all contained within this building.

**Graphic Arts**
The entire instructional facilities for the college's Industrial Engineering, Printing Engineering and Management, and Technical Journalism Departments are contained in this recently completed structure.

**Home Management Cottage**
As a modern home facility for teacher training in home economics, this unit provides living-in space for eight girls and an instructor.

**Library**
Completed in 1962, a functionally designed addition more than doubles the size of the Walter F. Dexter Memorial Library. The enlarged facility offers 1650 reader stations and book storage space for 150,000 volumes on four floors of stacks. Group study rooms, faculty reading room, typing rooms, a large curriculum library, and a browsing area for recreational reading are provided in addition to the other regular features of an excellent modern college library. Bookstacks throughout the library are open to all readers, and professionally trained librarians are ready to give assistance to students and faculty in the use of library materials.

**Little Theater and Music**
In addition to a 500 seat Little Theater and its fully rigged stage, dressing, scene construction and storage rooms, this building has all the facilities necessary for the college's Music Department including sound engineered individual and group practice rooms.

**Machine and Welding Shops**
Two large, well-equipped and well-lighted shops with adjacent specialized laboratories comprise these facilities.

**Mathematics and Home Economics**
This building includes facilities for mathematics and specialized home economics laboratories; 14 general purpose classrooms, and offices for mathematics and home economics faculty.
San Luis Obispo Campus
Mechanical Engineering Laboratory
This unit houses part of the laboratories for the Mechanical Engineering Department, fully equipped with internal combustion engines, steam turbine, gas turbine, fuel test engine, and a wide variety of instrumentation, and is adjacent to college central steam heating plant which is also used for special experiments by the Mechanical Engineering Department.

Science
This building contains twelve general-purpose classrooms and 32 fully equipped laboratories. The laboratories provide facilities for instruction in soil science, veterinary science, botany, zoology, bacteriology, chemistry, and physics.

AGRICULTURAL UNITS

Beef Unit
Two project steer feeding barns, capacity 150 steers; commercial project feeding barn, capacity 200 steers; three barns for breeding beef cattle; 1,600 acres range and pasture; judging pavilion. Residence facilities for 12 students.

Central Feed Mill and Storage
Complete feed mill for grinding, mixing, and processing feeds; bulk storage for 1,500 tons of grain; hay barn, 600 tons capacity; hay grinder unit; sack storage for 250 tons concentrates and 25 tons bulk storage bins for mixed feeds.

Crops Unit
Vegetable packing and grading shed; fruit shed, beekeeping laboratory; deciduous orchard; citrus and avocado acreage; vineyard. Sixty acres of cultivated land provide for field crop and truck crop projects.

Dairy Unit
Thirty-unit milking barn; two shelter feed barns for 100 cows, judging pavilion, young stock barn, bull barn, and complete creamery building. Student project unit: milk barn, feed shelter barn for 70 head of student-owned projects, and calf sheds; 600 acres of pasture. Three dormitories for 36 students.

Horse Unit
Thoroughbred, quarter horse, and draft horse barns, paddocks, and pasture.

Ornamental Horticulture Unit
Propagation and storage building; four glasshouses, three lathhouses, and other propagation units; five acres for storage and growing area; 100 acres of landscaped campus.

Poultry Unit
Central egghouse, slaughter plant, battery brooder and incubation building; laying trap nest cage units and colony houses to handle 5,000 laying hens, 10,000 fattening birds, and 500 turkeys.

Sheep Unit
Central lambing barn; project feeding barn, capacity 400 lambs; 160 acres range and pasture.

Slaughterhouse
Modern slaughterhouse, coolers, and meat cutting room.

Soils Unit
Three soils laboratories, two special preparation labs, lathhouse and glasshouse. Cropland and range area for fertilizer trials.

Swine Unit
Fourteen-unit central farrowing house; 18 double-unit colony houses; five boar units; 16 project feeder units; 30 acres of pasture. Yearly capacity, 800 head.
STUDENT HOUSING AND DINING FACILITIES

On-campus Housing—Men
The San Luis Obispo campus has four new three-story residence halls for eight hundred men students. These four buildings are newly constructed, newly furnished, and large lounge rooms and recreation rooms are provided.
In addition to the new residence halls there are six two-story permanent type residence halls, eight single-story dormitories, and five student cottages located at various agricultural units. A total of 1,581 single men students can be accommodated in these on-campus housing units.

On-campus Housing—Women
Trinity and Santa Lucia are two new, three-story residence halls to provide on-campus housing for 400 women students. These new halls are well located, attractive, newly furnished, and designed for comfortable, pleasant living. Each hall has a large lounge, a recreation room, sewing room, and are under trained adult supervision. In addition there are three two-story permanent residence halls available for women students.

Family Housing
There are a few one- and two-bedroom dwellings used to house families with children. These are very much in demand and a waiting list is maintained in the Housing Office.
The Off-Campus Housing Office maintains lists of available apartments, houses, and facilities in the area suitable for married students.

Dining Hall
A new, modern dining hall which serves three meals daily, Monday through Friday, and late breakfast and early dinner on Saturdays and Sundays can accommodate 2,400 students per meal. In addition to the dining hall for regular meals, a snack bar is provided, seating 400 students.

Health Center
The student Health Center is a well-equipped clinic and infirmary.

SPECIAL INSTRUCTIONAL SERVICES

SUMMER QUARTER
The college offers a summer quarter for old and new students. Summer quarter offerings make it possible for a student to shorten the overall length of time necessary to complete a prescribed curriculum.
The summer quarter is divided into four- and six-week periods, making a total of 10 weeks. Students may elect to enroll for either the four- or six-week period or both if they choose.
Summer students are permitted a maximum load of 1 1/2 quarter units per week of attendance. The maximum load in the four-week term is six units, and in the six-week term, nine units.
Admission requirements, fees and deposits, and other regulations are the same for the summer quarter as for the other three quarters of the school year.

INSERVICE TRAINING IN AGRICULTURE
The college plays an active role in the inservice training of teachers of vocational agriculture by providing instructional staff and facilities for workshops and training programs co-operatively sponsored by the college and the State Bureau of Agricultural Education.
The college provides an annual one-week summer skills program. The content varies, depending upon the needs and desires of the teachers as these are expressed through the Bureau of Agricultural Education. College staff 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 on the San Luis Obispo campus with an attendance of 400-500 persons. Facilities, special speakers, exhibits, and other services are provided by the college.

**RESERVE OFFICERS TRAINING CORPS**

California State Polytechnic College maintains an elective General Military Science Unit, Senior Division, of the Army Reserve Officers' Training Corps (ROTC) for the purpose of preparing students to become officers in the Army of the United States. Under the General Military Science curriculum, a student is given general army training without specialization in any one branch. For those students who are selected and who pursue the advanced course (third and fourth academic years), a choice of branch will be made prior to commissioning based upon the needs of the service and the individual's desires, academic background and abilities.

The Department of Military Science serves the students of the entire college as well as contributing to the development of qualified officers for the Army of the United States. For additional information about ROTC see under MILITARY SCIENCE DEPARTMENT, Applied Sciences Division.

**STUDENT ORGANIZATIONS AND ACTIVITIES**

The college provides an integrated program of classroom and laboratory instruction, gainful employment, and co-curricular activities. The latter are under the direction of the Associate Dean (Activities) who is responsible for initiating and coordinating a well-rounded program of activities designed to develop leadership qualities in all students.

**STUDENT GOVERNMENT**

All students are members of the student association known as the Associated Students of the California State Polytechnic College. The government of student affairs and the control of property are vested in the Student Affairs Council, the members of which are selected according to regulations established in the student body constitution. In addition, there are boards established to oversee publications, athletics, music, College Union program, and Poly Royal. 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. Conference competition is maintained in most sports as a member of the California Collegiate Athletic Association. A full program of intercollegiate competition is offered in football, basketball, baseball, track, wrestling, gymnastics, swimming, water polo, golf, and cross country, all of which are major sports. Awards are given to letter winners. Freshman competition is offered in sports where competition is available and sufficient interest warrants it.

The Department of Physical Education offers physical activities designed to provide a sound program of recreation, education in physical skills, and the give-and-take of games. Varsity teams in the intercollegiate sports offer opportunity for the more skilled. Intramural teams provide year-round competition in a dozen sports at an easier level of play to all who wish to enter. Trophies are awarded winners in touch football, track, horseshoes, basketball, volleyball, swimming, boxing, wrestling, badminton, softball, tennis and golf. For eligibility rules see ELIGIBILITY FOR INTERCOLLEGIATE ATHLETICS.

**PUBLICATIONS**

Publications of the student body at the California State Polytechnic College, San Luis Obispo, are not only written and edited by students, but are also printed...
in the college's printing department as laboratory work for students majoring in printing. Editorial and photographic work for publications is handled primarily by students of the journalism classes. Among the publications, two are outstanding. *El Mustang*, the official newspaper of the associated students of the San Luis Obispo campus, is published twice each week during the school year. *El Rodeo* is the yearbook of the San Luis Obispo campus. Miscellaneous publications include the *California Future Farmer* magazine, a monthly magazine supported by and mailed to 10,000 Future Farmers of America members in nearly 200 California high schools; the Mustang Handbook; *Poly Syllables*, a student literary magazine.

**POLY ROYAL**

Each year during the spring the San Luis Obispo campus has an open house exhibition and show conducted primarily by the Associated Students. This event is known as Poly Royal, "A Country Fair on a College Campus." Its purpose is to display work accomplished during the year by students. Each department of the college 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 dramatic presentations, aquacade, carnival, various judging contests that involve adult visitors, and a mathematics contest featuring students from high schools throughout the State.

**CAMPUS ORGANIZATIONS**

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. The college does not recognize either national or local social fraternities or sororities and students are advised against participation in unofficial student organizations that are not in keeping with the college's traditions.

**STUDENT PERSONNEL SERVICES**

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

**Counseling and Testing**

The Counseling Center, under the direction of the Associate Dean (Counseling and Testing) offers service in vocational, educational, and personal counseling in accordance with the needs of the student. A well-equipped test center, under the direction of the Test Officer, is available to assist the students and counselors.

**Advising**

Each new student is assigned an adviser when he enrolls at college. This adviser helps the new student solve problems involved in becoming oriented to college life and helps to arrange a sound course of study for him. Returning students and college transfers are also assigned an adviser who helps the student arrange his instructional program.

**Health Service**

The college provides limited medical services paid for in part by the State and by the student through his materials and service fee and a voluntary quarterly fee. These are designed to provide the services of the family physician while the student is in college and do not include the service of any specialists. Diseases of a chronic nature which a student contracted before entering college are not covered. Students may consult the college physicians at the Health Center by appointment.
San Luis Obispo Campus

The college maintains a well-equipped clinic and infirmary beds for both men and women students. The Health Center is recognized as a hospital by the American Medical Association. In the event that special hospitalization is required, students may enter one of the hospitals located in San Luis Obispo. The student must pay for any such hospitalization. Student health insurance covering most extra hospitalization costs is available at the time of registration.

Registration is not complete until a student has completed the physical examination satisfactorily or made other arrangements with the Dean of Students.

Student Housing and Dining Services

ON-CAMPUS HOUSING

The residence halls on the San Luis Obispo campus house 1,463 men students and 578 women students. An additional 75 men students are housed in student cottages located at various agricultural units.

The college believes a stimulating intellectual and social environment in housing units is an important part of the student's education. Study is encouraged through the observance of regular quiet hours, and residents also have ample opportunity to participate in intramural activities, discussion groups and exchange parties with other halls. Lounges and recreation rooms are provided in, or adjacent to, all the halls. Each hall has its own student government organization for planning and carrying out its activities.

The halls are staffed by professional personnel, headed by the Housing Coordinator. The women's halls and four of the large men's halls have professionally trained head residents living in the halls. Trained student managers assist the head residents in the large halls and are resident managers of the smaller men's halls.

New students who wish to live in the residence halls request on-campus housing when they apply to the college for admission. Assignment to available on-campus housing is made according to the date of acceptance for admission to the college.

Applicants for on-campus housing are contacted by the Housing Office and advised of the availability, or the unavailability of, on-campus housing after they are accepted for admission to the college. This notification is normally made shortly after June 1 for the Fall Quarter.

Housing licenses are mailed to students accepted for on-campus housing. Signed licenses, accompanied by the required payment, must be returned by the deadline stated in the license. Failure to return the license, or failure to make the required payment by the deadline, automatically results in loss of housing assignment.

Students residing in the residence halls are requested to purchase meal tickets for food service in the college dining halls. A security deposit of $20 is required.

OFF-CAMPUS HOUSING

The college's Housing Office maintains a list of housing available in the community. There are a few large privately-owned and operated cooperative housing units for single men and women students in San Luis Obispo. A large number of apartments and rooms in private homes is also available for either men or women students.

The college does not inspect or approve apartments or rooms in private homes. It does maintain a listing service which is available free of charge to all students. Inquiries about the listing service should be made in person at the College Housing Office.

Single women students under age 21 are expected to live on-campus, at home or in college approved off-campus housing. A few off-campus housing units are approved by the Associate Dean, Women as off-campus residences for women. Information about these residences is available at the Housing Office. Women students may live in unapproved housing such as apartments or private homes only if advance written parental permission is filed with the Associate Dean, Women prior to registration.

FAMILY HOUSING

There are a limited number of one and two bedroom dwellings for married students with children on-campus. One bedroom units rent for $40 per month and
two bedroom units rent for $45 with utilities extra per month. The apartments are unfurnished and the occupants must furnish their own major appliances. Information about these apartments is available at the Foundation Business Office. The apartments are rarely available to new students.

The Housing Office maintains a list of apartments and rooms available to married students. It does not inspect or approve the facilities listed. Inquiries about the listing service should be made in person at the Housing Office.

**Dining Hall**

The dining hall is a modern attractive facility which includes two dining rooms and a spacious snack bar. The dining rooms are capable of accommodating 2,400 students per meal and the snack bar seats 400. Dietetically planned meals are served cafeteria style in the dining rooms.

Students residing in the residence halls are required to purchase meal tickets. Students living off-campus may purchase meal tickets for use in the dining halls or they may rely on the snack bar for food service. The meal ticket includes nineteen meals per week. These are breakfast, lunch and dinner five days a week and lunch and dinner on Saturday and Sunday. Meal tickets are not used in the snack bar.

**Placement**

A centralized placement service is available to all students and alumni of the college. The Placement Office and departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience.

A followup program conducted by the Placement Office includes contacting both the graduate and employer to appraise the effectiveness of the instructional programs in light of employer needs, and the satisfaction of employer and employee.

**Financial AIDS**

The college 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 information may be obtained by writing to the Dean of Students.

**Scholarships—San Luis Obispo Campus**

A number of freshman scholarships are available at California State Polytechnic College for students immediately after they have graduated from high school. In all cases, evidence must be submitted that additional financial assistance is necessary in order for the applicant to attend college.

The sophomore and advanced scholarships are granted on the basis of performance of the individual in his work and activities at California State Polytechnic College.

Applications for scholarships may be made by writing to the Admissions Office, California State Polytechnic College, unless otherwise stated.

**Freshman Scholarships**

**Agriculture Scholarship for Paso Robles Students**

One annual scholarship of $500 is awarded to a vocational agriculture student who is graduated from Paso Robles High School and who enrolls in the agricultural division at San Luis Obispo the following fall.

**Lulu G. Bumphrey Scholarship**

One annual $200 scholarship is awarded to a male student graduating from Atascadero Union High School.

* Scholarships and loans at the Kellogg Campus are listed in the Kellogg section of the catalog.
San Luis Obispo Campus

California State Grange Scholarships

Two California State Grange scholarships of $250 are available for entering freshmen students who will enroll to study Animal Husbandry, Dairy Husbandry, or Field Crops at the San Luis Obispo Campus.

Challenge Creamery Scholarship

One annual scholarship of $100 is awarded to a Future Farmer student who excels in dairy production and who enrolls as a freshman in dairy manufacturing at California State Polytechnic College. Applicant is chosen from the entire State.

Th. R. and Valley M. Knudsen Foundation Scholarship

The Th. R. Knudsen and Valley M. Knudsen Foundation provides one annual $500 scholarship for a student who enrolls in dairy manufacturing. This award is not restricted to entering freshmen, but where applicants are of equal merit preference shall be given to the entering freshman.

The E. C. Loomis and Sons Scholarship

One annual scholarship of $100 is awarded to the outstanding graduate in the high school vocational agriculture department at San Luis Obispo, Arroyo Grande, Santa Maria, or Cambria.

San Luis Obispo Cowbelles Scholarship

One annual $100 scholarship is awarded to an incoming woman student who will enroll in Home Economics or Animal Husbandry. The recipient must be a graduate of a San Luis Obispo County High School, must have resided in the County for at least one year, and must evidence an interest in beef promotion.

Sears-Roebuck Foundation Agriculture Scholarship Awards

Ten annual scholarships of $300 each to be awarded to entering men students who enroll as freshmen in one of the agriculture majors or agricultural journalism.

The scholarship award to an applicant is determined on the basis of:
1. Financial need for assistance to continue his education.
2. Interest in agriculture and accomplishments as evidenced by his supervised home farm program.
3. Scholarship as shown on the transcript of high school credits which shall include a statement of the number in the graduating class and the applicant's scholarship ranking in the class.
4. Citizenship and moral integrity, as certified by the high school principal, agricultural teacher, and others qualified to pass judgment on the applicant.

Application may be made through the local high school agricultural teacher who will have all the necessary information. Applications should be in the hands of the scholarship committee by April 1st.

Sears-Roebuck Foundation Home Economics Scholarship Awards

Three annual scholarships of $300 each to be awarded to entering women students who enroll as freshmen in the major in home economics.

The scholarship award to an applicant is determined on the basis of:
1. Financial need for assistance to continue her education.
2. Interest in home economics as evidenced by her total program during the high school years.
3. Scholarship as shown on the transcript of high school credits which shall include a statement of the number in the graduating class and the applicant's scholarship ranking in the class.
4. Citizenship and moral integrity, as certified by the high school principal and others qualified to pass judgment on the applicant.

Marguerite S. Tyson Scholarship

An annual award of $500 to an incoming student in the field of Dairy Production. One of the conditions of this award requires projects and similar activities with Guernsey cattle.
U.S. Motors Foundation Scholarship

The U.S. Motors Foundation provides four annual scholarships, each in the amount of $250 per year: one for a freshman, one for a sophomore, one for a junior, and one for a senior student. These scholarships are awarded to students majoring in the electrical power field.

West Coast Electronic Manufacturers' Association Scholarship

One $300 scholarship is made available each year to a freshman student entering the Electronic Engineering Department.

Leopold Edward Wrasse Scholarships

Approximately 70 Wrasse scholarships in the amount of $500 each are available annually to freshmen and advanced students enrolled in agriculture. These scholarships are derived from the income of the Leopold Edward Wrasse Scholarship Fund established by the will of Leopold Edward Wrasse.

The qualifications required of applicants are: (1) they must be of good character, industrious, and in need of assistance; (2) they must demonstrate interest in a major agricultural field of study offered by the California State Polytechnic College and have sufficient academic preparation and other background to show promise of success; except that students from Caruthers Union High School may enroll for a major course of study offered in any of the three divisions at the College: agriculture, engineering, or arts and sciences; (3) they must have taken an active part in community or school activities and have earned a sum equal to one-half of the amount of the scholarship award within the 12-month period prior to receiving an award; (4) the applicants will be selected in the following priority: (a) Caruthers Union High School; (b) any high school in Fresno County; (c) other California secondary schools or California State Polytechnic College.

Advanced Student Scholarships and Awards

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Southern California Chapter, Scholarship

One annual $250 scholarship is provided for an engineering student on the basis of academic excellence in engineering work. The recipient must be entering the senior year.

American Welding Society, Los Angeles Section, Scholarship

One $150 award is made available to a student who has completed one year in his major, who has had a concentration of welding courses, and who has shown exceptional interest and aptitude in his field.

American Welding Society, Santa Clara Valley Section, Scholarship

One annual $100 scholarship is provided for a student studying in the field of metallurgy or specializing in welding.

L. L. Bennion Scholarship

Mr. Paul Grafe of the Grafe-Callahan Construction Company makes available an annual $250 scholarship known as the L. L. Bennion scholarship. This scholarship is awarded to an outstanding junior student who is specializing in the field of animal husbandry.

California Dairy Industries Association Scholarship

The California Dairy Industries Association provides one $600 scholarship which is to be awarded to a student specializing in the field of dairy industry.

California Association of Nurserymen's Scholarship

The California Association of Nurserymen makes available to the California State Polytechnic College an annual $100 scholarship. This scholarship is awarded to an outstanding sophomore student who is enrolled in the Ornamental Horticulture Department.

California Association of Nurserymen, Central Chapter, Scholarship

One annual $100 scholarship is provided for an advanced student in the Ornamental Horticulture Department.
San Luis Obispo Campus

California Association of Nurserymen, Monterey Bay Chapter, Scholarship

One annual $200 scholarship is provided for an advanced student in the Ornamental Horticulture Department.

California State Grange Home Economics Fund

The California State Grange has established a fund at the San Luis Obispo campus from which grants (not to exceed $100) may be awarded to currently enrolled women students from all divisions of the college who display academic ability but, due to unforeseen circumstances, would be unable to complete the quarter in attendance without financial aid.

Equipment Distributors and Manufacturers of Southern California Scholarship

One annual $500 scholarship is provided for an outstanding technical arts student on the basis of interest, ability and potential in industrial sales and servicing in construction equipment distribution and manufacturing.

Applicants completing their junior year in college will be given first consideration.

Emerald Distributors, Inc., Irrigation Award

An annual award in the amount of $100 to a junior or senior student majoring in agricultural engineering, mechanized agriculture, crops, soils, agricultural business management, or farm management. The award is to be based upon a paper written on irrigation engineering, water application, or any problems or practices relating to irrigation.

Hewlett-Packard-Alumni Scholarship

One Hewlett-Packard-Alumni Scholarship for an undetermined amount is provided for a student majoring in electronics engineering. The recipient must have completed at least five quarters of college level work. Funds for this scholarship are determined by the amount raised by alumni employees and matched by Hewlett-Packard Company.

Lillard Company Scholarship

One annual scholarship of $350 is awarded to a student specializing in the field of air conditioning.

John C. Lindsay Award

An annual award of $100 will be made to the junior student in architectural engineering, who in the opinion of the staff, has presented the best problem during the year.

Mattel, Inc., Toymakers Scholarships

Two $300 scholarships are awarded to juniors, one majoring in Industrial Engineering and one in Mechanical Engineering. The recipients must be outstanding scholars who have participated in co-curricular activities.

Neely Enterprises Scholarship

Two $250 awards to sophomores majoring in the field of electronics. Recipient is chosen on the basis of need, academic ability, resident of California, Arizona, Nevada, or New Mexico, and the general participation in college activities.

North American Heating and Air Conditioning Wholesalers Association Scholarship

An annual scholarship of $350 is awarded to a student majoring in the air conditioning and refrigeration engineering field by the North American Heating and Air Conditioning Wholesalers Association.

Page Memorial Scholarship

This $500 annual award is made available through the California Newspaper Publishers Association to a junior majoring in printing. A condition under this scholarship is that the awardee desire to work for a member paper of this organization.
Parent-Teachers Association Scholarship

The California Congress of Parents and Teachers has made available two $400 scholarships to be awarded to junior, senior, or graduate students in elementary education who intend to teach in the public elementary schools of California upon graduation. The award will be made on the basis of financial need and excellence of qualifications for the teaching profession.

The Poultrymen's Cooperative Association of Southern California Scholarship

One annual scholarship of $200 is awarded to an outstanding student who is majoring in poultry husbandry and who has completed at least three quarters of work in this department. The applicant must be a resident of one of the following counties: Fresno, Kings, Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, San Diego, San Luis Obispo, or Ventura.

Harry E. Rosedale Memorial Scholarship

One $100 scholarship is made available for a student enrolled in ornamental horticulture at the San Luis Obispo campus. The student must have completed one year of work in ornamental horticulture and must have been recognized in the ornamental horticulture field as expressed by employers' letters.

Rotary Scholarship

The San Luis Obispo club of the Rotary International makes available to California State Polytechnic College one $400 scholarship. This scholarship is awarded to a student of outstanding ability in co-curricular activities. This student must maintain a better than average record and must have at least junior standing in the fall quarter following the scholarship awards. The first awards were made in the spring of 1947.

Sears-Roebuck Foundation Sophomore Scholarship

Sears, Roebuck Foundation, as a continuation of the freshman scholarship plan already described, awards a $300 sophomore scholarship to the most outstanding student of those receiving Sears-Roebuck awards as first-year students.

Solar Aircraft Company Scholarship

Three annual $100 scholarship awards are made available for engineering students who are entering their junior year and who are citizens of the United States with a minimum of three quarters of work completed in residence at the California State Polytechnic College. One $500 scholarship is made available for an engineering student who will enter the senior year and who has been a recipient of one of the $100 Solar Aircraft Company scholarship awards as a junior student.

Soroptomist Scholarship

One $400 award is made by Soroptomist International of San Luis Obispo to a woman graduate of San Luis Obispo High School or Mission High School. The recipient must be a graduating high school senior or presently enrolled at Cal Poly and must be a resident of the San Luis Obispo High School District.

Sutherland Hutton Metallurgy Scholarship

One $300 scholarship to be awarded to an undergraduate student specializing in the field of metallurgy.

Tractor and Implement Club of Southern California Scholarship

The Tractor and Implement Club of Southern California provides one $500 scholarship for a sophomore or junior student who is specializing in the field of Agricultural Engineering. Preference is given the student with interest in the power and machinery or mechanized agriculture phases of Agricultural Engineering.

Wellington Davey Scholarship

One $300 scholarship to be awarded each spring to a student specializing in the field of ornamental horticulture. First preference will be given to sons or daughters of employees of Davey Tree Surgery, Ltd. who are majoring in ornamental horti-
culture. If no progeny of the Davey Company apply, then the scholarship will be made to another member of the Ornamental Horticulture Department, based on interest, accomplishments and academic standing.

Western Electronic Manufacturers' Association

Three $250 scholarships are made available each year to students who have successfully completed a minimum of three quarters of work in the Electronic Engineering Department.

Western Electric Fund

Annual scholarship in the amount of $400 is provided by the Western Electric Company for an undergraduate student in the engineering division.

Leopold Edward Wrasse Scholarships

These scholarships, described above under "Freshman Scholarships," are also available to advanced students enrolled in an agricultural major.

OTHER SCHOLARSHIPS

Bank of America, N. T. & S. A. Scholarships

Four annual $200 scholarships are awarded at the Grand National Junior Livestock Exposition on the basis of excellence of performance in the farm home program in the production of livestock. Applicants are limited to those participating in this special event. These scholarships may be used at the California State Polytechnic College.

Business and Professional Women's Club of San Luis Obispo

The Business and Professional Women's Club of San Luis Obispo provides one annual $250 advanced scholarship for a woman student who is a resident of San Luis Obispo County and who will enroll at the California State Polytechnic College after the completion of two years of college work, either at Cal Poly or at another four-year college or junior college. Prospective applicants should contact the club secretary.

California Seed Association Scholarship

One annual scholarship of $150 is offered to a Future Farmers of America member in California by the California Seed Association. The applicant must have an outstanding home farming program in truck crops or seed production, or an outstanding record in crops judging, and must enroll in crops production at certain California agricultural colleges including California State Polytechnic College. Application forms are available from high school FFA chapter advisers.

Union Pacific Railroad Scholarships

Four $200 scholarships are made available by the Union Pacific Railroad, Omaha, Nebraska. Applicants must have completed two or more years of vocational agriculture, or 4-H club work, including commendable projects. One scholarship is to be awarded to one resident in each of the following counties: Los Angeles, Riverside, San Bernardino, and Orange. Scholarships may be used at California State Polytechnic College, University of California, or Chaffey Junior College. All applications, however, must be submitted not later than April 15. Scholarships shall be used within the calendar year after the date of graduation from high school. All project books, a picture of the applicant, and, if possible, pictures of his project must accompany the application.

Safeway Stores, Inc., Scholarships

Two annual $200 scholarships are awarded at the Grand National Junior Livestock Exposition on the basis of excellence of performance in the farm home program in the production of livestock. Applicants are limited to those participating in this special event. The scholarship awarded to a Future Farmer must be used at California State Polytechnic College.
Santa Fe Scholarship

One annual scholarship of $250 is offered to a Future Farmers of America member in California by the A. T. and S. F. Railway. The scholarship may be used at certain agricultural colleges within the State, including California State Polytechnic College. Application forms are available from high school FFA chapter advisers.

South San Francisco and Stockton Union Stockyards Company Scholarships

Two annual $100 scholarships are awarded at the Grand National Junior Livestock Exposition on the basis of excellence of performance in the farm home program in the production of livestock. Applicants are limited to those participating in this special event. The scholarship award to a Future Farmer must be used at California State Polytechnic College.

Standard Oil Company of California Scholarships

Thirty annual scholarships of $300 each are offered by the Standard Oil Company of California to members of the Future Farmers of America and members of 4-H clubs in California. Any of these scholarships may be used at California State Polytechnic College or other colleges. Future Farmers should apply through their agriculture teachers, 4-H club members through their club leaders and county club advisers.

STUDENT LOAN FUNDS

Student loan funds are available to provide temporary assistance to worthy 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 should be made in the office of the Dean of Students.

The character and integrity of the student are the primary qualifications for obtaining a loan. Evidence of real need for such temporary assistance must be shown. Students who have spent funds far beyond the necessary school expenses will not be considered for loans, even though need is shown.

Agricultural Engineering Society Loan Fund

The student chapter of the Agricultural Engineering Society of the college has established a loan fund to be used for either long- or short-term loans. Although preference is to be given to students majoring in agricultural engineering or mechanized agriculture, other students are not excluded from receiving loans from this fund.

Alpha Zeta Loan Fund

The student chapter of Alpha Zeta, the national agricultural scholastic honor society, has provided a loan fund for needy students with a preference given to students majoring in agriculture, but not excluding others when sufficient funds are available to meet the needs of agriculture students.

Alumni Association Loan Fund

The Alumni Association of Cal Poly has established a loan fund to provide financial assistance to deserving students. Both long- and short-term loans can be made from this fund.

American Society of Heating, Refrigerating and Air Conditioning Engineers Loan Fund

A fund made available by the Southern California Chapter of the Society to provide emergency financial aid to needy students majoring in the air conditioning and refrigeration curriculum.

Pete Bachino Memorial Loan Fund

This loan fund was established by family and friends in memory of Pete Bachino, a San Luis Obispo businessman who was a true friend of the college and its students. The fund is to provide both emergency financial aid and long-term educational assistance to needy students.
Edgar E. Bilodeau Loan Fund

This fund, given by Mrs. Dorothy Bilodeau in memory of her husband, is primarily for engineering students, although other students are not excluded.

California Association of Refrigeration Service Engineers Loan Fund

A loan fund established by the California Association of Refrigeration Service Engineers Society to provide emergency financial aid to students with preference given to students majoring in air conditioning and refrigeration.

California Polytechnic Memorial Loan Fund

A loan fund has been established from the contributions made by numerous persons. It is designed to aid students who need immediate financial assistance.

The California State Polytechnic Women's Club Fund

The social club of women staff members and faculty wives at San Luis Obispo has established a student loan fund, increased each year by some type of public benefit. Loans are made to deserving students after one quarter of successful attendance.

W. B. Camp Revolving Scholarships in Agricultural Journalism

W. B. Camp of Bakersfield has provided $1,000 to be used for either short- or long-term loans for students enrolled in the field of agricultural journalism. Preference for these loans is given first-year students. However, other students are not excluded if sufficient funds exist.

W. B. Camp Educational Loan Fund

The Georgianna Camp Foundation of Bakersfield has established a $5,000 W. B. Camp Educational Loan Fund to be used for making short- or long-term loans to students enrolled in the field of agricultural journalism. Preference is given to applicants who have successfully completed at least two academic quarters in agricultural journalism and who have farm backgrounds.

Court Evergreen, Independent Order of Foresters Loan Fund

A special loan fund made available by the Local Court Evergreen of the Independent Order of Foresters to provide short-term assistance to needy foreign students both for help in registration and for emergency financial aid.

Horseshoeing and Animal Husbandry Loan Fund

A loan fund of $600 has been granted by the former Horse and Mule Association of America to students enrolled in the special horseshoeing program.

Chris Jespersen Fund

A loan fund has been established by the faculty of the college in memory of Senator Chris Jespersen. This fund is to provide loans to needy students.

Issac Baer Fund

The Issac Baer Loan Fund has been established by a Cal Poly faculty member who wishes to remain anonymous. The purpose of this fund is to provide senior students with money to move from college to their place of employment in their first job out of Cal Poly.

Lee Gird Levering Memorial Loan Fund

The family and friends of Lee Gird Levering, a student killed in the Korean War, have established a memorial loan fund in his memory. The purpose of this fund is to make sums available to deserving students at California State Polytechnic College. Although preference is given to students majoring in sheep husbandry, animal husbandry, or in agriculture, other students are not excluded from receiving loans from this fund.
Lynn T. Lobaugh Memorial Loan Fund
The many friends of Mr. and Mrs. Harold Lobaugh established this memorial loan fund in the memory of Lynn T. Lobaugh, a member of the Cal Poly varsity football team who was killed along with 16 other Cal Poly students in the October 29, 1960, airplane crash at Toledo, Ohio. The purpose of this fund is to make loans available to deserving students at the San Luis Obispo campus of the California State Polytechnic College. Although preference is given to students residing in Huntington Park, South Gate, Lynwood, and Downey and to members of Cal Poly athletic teams, or majors in social science, other students are not excluded from receiving loans from this fund.

The Rotary Club Fund
The San Luis Obispo Rotary Club has established a student loan fund open to any deserving student after one quarter of successful attendance.

Sears Roebuck Foundation Loan Fund for Foreign Students
This loan fund was established by the Sears Roebuck Foundation to assist foreign students at registration who may have difficulty obtaining funds from their homes due to a variety of reasons including international banking problems. Loans will be issued in amounts up to $100.

Laura E. Settle Loan Fund
A loan fund has been established by the California Retired Teachers Association in memory of Laura E. Settle who was instrumental in founding this organization. This money is available to Education majors.

Student Accommodation Loan Fund
The California State Polytechnic Women’s Club and the Associated Students have set up a fund from which students may secure small, short-term loans.

Telegram Tribune Loan Fund
A loan fund has been established by the Telegram Tribune, San Luis Obispo daily newspaper, to make short-term loans to deserving students in the fields of journalism and printing engineering and management.

Todd Farm Bureau Emergency Loan Grant
A fund provided by the Todd Farm Bureau to assist needy students of agriculture whose home is in Sonoma County.

Wilder Memorial Loan Fund
The Alumni Association sponsors the Wilder Memorial Loan Fund in memory of Dr. G. W. Wilder, from which small, short-term loans are made to deserving students.

The Wrasse Fund
The Leopold Edward Wrasse Loan Fund was established for the benefit of deserving boys desirous of an education and needing financial assistance.

Yellow Dog Los Angeles Kennel Loan Fund
The Yellow Dog Society, Los Angeles Kennel, has established a student loan fund to be used for either short- or long-term loans. Although preference will be given to students majoring in dairy husbandry and dairy management, other students are not excluded from receiving assistance from this loan fund.

NATIONAL DEFENSE STUDENT LOAN PROGRAM
The College participates with the Federal Government and the State of California in making available loans to students under provisions of the National Defense Education Act.
Entering freshmen as well as students in advanced standing in any field of study are eligible, although the law provides that special consideration shall be given to
San Luis Obispo Campus

(a) students with superior academic background who express a desire to teach in elementary or secondary schools, and (b) students whose academic background indicates a superior capacity or preparation in science, mathematics or engineering. Cal Poly has programs in all of these fields of learning.

The maximum loan to one individual is $1,000 in any one academic year, and no more than $5,000 total. Loans must be repaid with 3 per cent interest over a period of 10 years beginning one year after the individual ceases to be a full-time student at an institution of higher education. However, a borrower may have 10 per cent of the loan, and the interest thereon, cancelled for each full year of full-time public elementary or secondary school teaching, up to a maximum of 5 years and 50 per cent of the loan.

FINANCIAL AWARDS

John Badgley and John Ross Award

One award of $100 to the Freshman Architecture student who has excelled in scholarship with emphasis placed on work in his major.

Carl Beck Scholarship Awards

Two $50 awards presented by the Farm Management Club to needy farm management students who have demonstrated outstanding scholarship and have participated in student activities.

California State Polytechnic College Women's Club

Four awards of $50 each to be given with a certificate of merit to the outstanding woman student of each class. Criteria for selection include both academic and activities excellence.

Falk and Booth Scholastic Award

An award of $150 to a Senior Architecture major who has excelled in scholarship with emphasis on major work.

Dr. Albert Gazin Award

An award of $100 to a Sophomore Architecture major who has excelled in scholarship with emphasis on major work.

Graham Paint Store Award

An award of $50 to the student who has demonstrated excellence in the Theory of Design Class.

Lew Litzie Award

An award of $100 to a Junior Architecture major who has excelled in scholarship with emphasis on major work.

Poly Phase Award

Awards of $15.00, $20.00, and $25.00 along with certificates of merit are presented by the Poly Phase Club to Freshman, Sophomore, and Junior Electrical Engineering majors who have demonstrated a balance in academic and co-curricular excellence.

Santa Barbara Chapter—A.I.A. Award

An award of $100 presented by the Santa Barbara Chapter of the American Institute of Architects to the Senior Architecture student who in the opinion of his peers has done most to inspire student and professional relations.
STUDENT EMPLOYMENT

Summer Employment

Students are encouraged to take summer employment in fields related to their major. On-the-job application of course material stimulates an interest in and shows a need for subsequent courses.

The Placement Office receives many summer job listings. Ranchers and businessmen visit the campus in person and large business concerns send recruiters to interview undergraduates for summer employment. A summer job often leads to permanent employment.

Part-time Employment

In addition to employment opportunities off campus, students may earn money through project activities. Too, the college has established a policy of giving a maximum number of students experience by employing them to assist in the operations of the entire campus and farm. The number of campus jobs is greater than in the typical college where regular full-time employees do much more of the work.
FEES AND EXPENSES

STATE FEES AND DEPOSITS

Materials and service fee (quarter)
Each student enrolled for six units or less ........................................... $13.00
Each student enrolled for over six units .................................................. 25.50
Each student enrolled in summer quarter .............................................. 25.50
Nonresident tuition (U.S.):
Each student enrolled for 15 units or more (per quarter) ....................... 167.00
Each student enrolled for less than 15 units (per quarter per unit or fraction of unit) ......................................................... 11.50
Nonresident tuition (Foreign):
Each student enrolled for 15 units or more (per quarter) ....................... 86.25
Each student enrolled for less than 15 units (per quarter per unit or fraction of unit) ......................................................... 5.75
Late registration fee .................................................................................. 5.00
Transcript of record (no charge for first copy) ........................................ 1.00
Course credit by special examination fee (per unit) .................................. 1.00
Extension course fee (per unit) ................................................................. 6.50
Conference, Short Course or Institute, per person .................................... Estimated Cost
Application fee .......................................................................................... 5.00
Change of program fee ............................................................................... 1.00
Failure to meet administratively required appointment or time limit ........ 2.00
Check returned for any cause ...................................................................... 2.00
+ Parking fee (nonreserved spaces, per quarter)
Each student enrolled for more than six units ......................................... 9.00
Each student enrolled for six units or less ............................................... 4.00
Each alternate car in addition to fee for first vehicle ............................... 1.00
Special groups, per week .......................................................................... 1.00

OTHER FEES *
Associated student card fee (fall quarter) ................................................ 7.50
Associated student card fee (winter and spring quarters, each) .............. 3.75
Post office fee (all students, per quarter) .................................................... 0.50
Voluntary medical fee (per quarter) .......................................................... 6.00
Graduation fee (must be paid at time application for graduation is sub-
mitted) ......................................................................................................... 10.00

Note: Fees for summer quarter are the same as for the other quarters. Fees are 
subject to change upon approval by the Trustees of the California State Colleges.

LIVING EXPENSES FOR STUDENTS LIVING IN 
CAMPUS RESIDENCE HALLS

Room and board per quarter, including parking fee (subject to change) .... $263.00
Housing security deposit (payable prior to occupancy) .......................... 20.00

Note: 1. Room and board payable in advance. Arrangements to pay in two 
equal 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 pay-
ments.

Note: 2. Students are required to furnish blankets, bed spreads, and study lamps.

Note: 3. The board plan includes three meals each day, Monday through Fri-
day, late breakfast and early dinner on Saturdays and Sundays. The cafeterias are 
closed on college holidays.

† Proportionate fees apply during summer quarter.
* Not state fees, subject to change.
TYPICAL STUDENT EXPENSES

Following is an estimate of typical expenses per quarter for students living in campus residence halls. Of the total amount, the student should be prepared to pay from $340 to $390, depending upon his major, at the time of fall quarter registration and approximately the same amount at the time of winter and spring quarter registration.*

Associated student card (fall quarter, $7.50, winter and spring quarters, $3.75 each) $7.50
Post office fee (per quarter) $50
Medical fee—optional (per quarter) $6.00
Materials and service fee (per quarter) $25.50
Room and board (19 meals per week) $263.00
Books and supplies (estimated) $50.00
Weekend meals (estimated $10 per month) $30.00
Laundry (estimated $10 per month) $30.00

Estimated total per quarter (approximately 3 months) $412.50

FAMILY HOUSING

The college Foundation has available the following partially furnished on-campus housing accommodations:

Poly Ninos, one-bedroom apartments, including utilities (per month) $40.00
Poly Ninos, two-bedroom apartments, including utilities (per month) $45.00
Housing security deposit (payable prior to occupancy) $20.00

Inquiries should be made of "Housing Officer," California State Polytechnic College, San Luis Obispo, for family housing either on or off campus well in advance of registration.

PREPARATION FOR ELEMENTARY AND SECONDARY SCHOOL TEACHING

CREDENTIALS OFFERED

California State Polytechnic College is accredited by the State Board of Education to recommend for the following credentials:

Standard Teaching Credential with Specialization in Elementary Teaching
Standard Teaching Credential with Specialization in Secondary Teaching

Recommended majors are:

Agriculture, Biological Sciences, Chemistry, English, Home Economics, Technical Arts (Industrial Arts), Mathematics, Physical Education (for men and women), Physics, and Social Sciences.

For teaching credential requirements consult the Education Department.

ADMISSION TO CANDIDACY FOR TEACHING CREDENTIAL

The selection of candidates to prepare for teaching is accomplished through a three-step process, involving teacher education committees. These committees determine policies for the teacher education program, review the qualifications of all candidates, and hear appeals where rejection of candidates has occurred. The three steps leading to the final completion of the credential are:

Step 1. Approval to enter the teacher education program
Step 2. Approval to participate in student teaching
Step 3. Final approval for a teaching credential

* Students enrolling under Public Law 550 should be prepared to pay all costs at the time of registration. Students enrolling under the auspices of other laws or agencies supplying educational assistance should check in advance with the appropriate agency representative regarding payment of fees and/or costs.

† Beginning engineering students should be prepared to pay up to $100 in their first quarter.
A student who enters the college with the intention of earning a teaching credential must be approved as a candidate for the particular credential which he is seeking. This procedure involves the filing of an application and completing certain steps as explained later in this section.

Admission to the college is not equivalent to being accepted for the teacher education program.

Requirements and procedures for qualifying for acceptance of candidacy may be secured in the Education Office. Prompt attention to the college's procedures is necessary since approval for candidacy is prerequisite to certain professional courses and student teaching.

Evaluation of the student's qualification is based on the following factors:

1. **Academic Aptitude.** The candidate shall demonstrate academic aptitude by showing a satisfactory score on a college aptitude test or by demonstrating compensating strength in other qualities.

2. **Scholarship.** Satisfactory scholarship on all work accepted by the College must be in evidence before approval of candidacy for the teaching credential.
   - Elementary credential—grade point average of 2.25
   - Secondary credential—grade point average of 2.50
   - Master's degree—grade point average of 2.75

3. **Professional Aptitude and Interests.** The candidate must demonstrate suitable aptitude and fitness for teaching and for adjusting to public school conditions. These qualities are evaluated by committees and are based on evidence provided through tests, interviews, and personal contacts.

4. **Physical Fitness.** Evidence of good physical health must be shown before the time of student teaching.

5. **Fundamental Skills.** Satisfactory performance must be shown in the areas of English usage, reading, spelling, arithmetic, science, handwriting, and the social sciences as indicated by scores on achievement tests.

6. **Personality and Character.** The candidate is expected to possess personality and character traits in keeping with the standards of the teaching profession. Qualifications are evaluated by committees and are based on tests, observations, and interviews.

7. **Speech.** The candidate must demonstrate satisfactory speech quality and habits as indicated by a speech interview or the satisfactory completion of a course in public speaking.

**ADVANCED STANDING—BACHELOR OF EDUCATION PROGRAM**

Candidates for the bachelor of education degree must qualify for admission and complete requirements for the degree specified in Title 5, California Administrative Code, Section 40502.

To be admitted to the bachelor of education program an applicant must:

1. Hold a California provisional general elementary or kindergarten-primary credential.

2. Present evidence of having satisfactorily completed a minimum of 90 quarter units (60 semester units) of standard college work.

3. Have the general elementary credential as his objective.

**PLACEMENT OF TEACHERS**

Every candidate for a credential must register with the Placement Office before or during the last quarter prior to completion of the credential requirements, but no later than March 1st. Registration includes the preparation of personal data, and the listing of references for the confidential teacher placement folder which is sent by the Placement Office to school administrators who are considering the candidate for a teaching position. This folder is maintained permanently by the Placement Office for use whenever the teacher wishes to seek a new position. Cooperation of the candidate in keeping information in the folder up to date is necessary for most effective service.
THE AGRICULTURE DIVISION
Flower Arrangement Lab in Ornamental Horticulture

Fruit Production Lab in Crops Department

At Work on a Student Agricultural Project
THE AGRICULTURE DIVISION

The Agriculture Division of the college prepares students in the field of agriculture with the main objective of giving them a full and broad understanding of basic factors involved in production, management, processing, distribution, marketing, sales and services in the fields of related business, to make efficient operators and managers. While the division stresses production techniques and basic management to benefit to the fullest extent those returning to the farm or entering employment in agricultural fields upon leaving college, it also requires a core of basic sciences related to the production courses of the major and a substantial block of general education subjects necessary to prepare the student to take his rightful place in a democratic society.

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

Curricula in the Agriculture Division are arranged so that a student receives a maximum of production courses in his major field early in the program. This means that even if a student terminates his formal education at any time prior to his graduation, he has acquired a background of fundamentals which makes him immediately employable in the occupational field of his choice. This system of taking production courses early in the curriculum makes it possible for the student to determine in a short time whether or not he is fitted for the curriculum he has selected. In addition, the early acquisition by the student of practical "doing" types of activities provides him with the incentive to learn the basic scientific explanations.

The Agriculture Division uses the California State Polytechnic College Foundation program of student projects to provide additional experience and practice to supplement regular production courses. This practical experience leads to the understanding of production and managerial problems that are important in the overall training of a student in agriculture.

Admission to the Agriculture Division requires high school graduation, with satisfactory grades, but does not require a specific pattern of courses taken in high school. However, a student who anticipates enrolling in the Agriculture Division of the college will find a strong background in mathematics and physical and biological sciences advantageous.

Curricula are offered in the following majors in the Agriculture Division at San Luis Obispo: agricultural business management, agricultural engineering, mechanized agriculture, animal husbandry, crops production, fruit production, dairy husbandry, dairy manufacturing, farm management, food processing, ornamental horticulture, poultry husbandry, and soil sciences.

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

The Veterinary Science Department offers courses which support the animal production majors.

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 instruction leading to specific preparation for the production field of the student's choice.

2. Related agriculture—Supporting courses in agriculture selected from closely allied fields. They supplement the major agriculture block in (1).

3. Science and mathematics—Courses selected from scientific fields which provide basic biological, physical and social science, and mathematical background and support to the agricultural block in (1) and (2) above.

4. Humanistic-social—Courses which provide cultural background for intelligent living in a complex world society.
The following chart illustrates the typical distribution of required units in the four areas indicating emphasis and balance through the four years. The entire program totals 198 quarter units including elective units which vary depending upon the student's major. Electives in the freshman and sophomore years are frequently chosen from agricultural courses.

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major agriculture</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Related agriculture</td>
<td>9</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Science and mathematics</td>
<td>18</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Humanistic-social</td>
<td>10½</td>
<td>8½</td>
<td>6</td>
</tr>
</tbody>
</table>

**TECHNICAL CURRICULA IN AGRICULTURE**

In keeping with the collegewide 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: agricultural business management, mechanized agriculture, animal husbandry, dairy husbandry and manufacturing, farm management, field, fruit, and vegetable crops, food processing, ornamental horticulture, poultry husbandry, and soil science. 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 of his selection 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 greatly assist him in agriculture after graduation. For admission requirements see "Requirements for Admission as an Undergraduate Student."

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

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 husbandry. Other majors follow a similar pattern. Detailed curriculum information is available from the Dean of the Agriculture Division and department heads.

**Freshman**

- **Feeds and Feeding (AH 101, 102)**
  - F: 2
  - W: 3
  - S: 4
- **Market Beef Production (AH 121)**
  - F: 4
- **Elements of Swine Production (AH 122)**
  - F: 4
- **Elements of Sheep Production (AH 123)**
  - F: 4
- **Agricultural Mechanics (AE 121, 122)**
  - F: 2
  - W: 2
  - S: 4
- **Applied English Composition (Eng 100)**
  - F: 3
- **Agricultural Math (Math 102)**
  - F: 3
- **Agricultural Project Records (FM 100)**
  - F: ½
  - W: ½
  - S: ½
- **Agricultural Biology (Bio 100)**
  - F: 3
- **Soils (SS 121)**
  - F: 4
  - W: 6

**Electives**

- F: 16½
- W: 16½
- S: 16½

* 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 100 is replaced by CP 100 for plant majors. All two-year technical students are required to take Math 102. Students in Mechanical Agriculture are required to take Math 102 and 103.
Agriculture Division

Sophomore

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep Husbandry (AH 221)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Beef Production (AH 222)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Market Swine (AH 223)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Agricultural Machinery (AE 221, 222)</td>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>* Prin. of Livestock Hygiene and Sanitation (VS 100)</td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Forage Crops (CP 123)</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>* Farm Records and Farm Mgr. Practice (FM 101B)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Education (PE 107)</td>
<td>1/2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sports Education (PE 241)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* U.S. Hist. and Government (Pol Sc 100)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractors (AE 141)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm Management or ABM Elective</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 1/2</td>
<td>16 1/2</td>
<td>15 1/2</td>
</tr>
</tbody>
</table>

A student enrolled in the technical program may transfer to a degree program by following the procedure under "Change of Curriculum."

HORSESHOEING

A 12-week short course in horseshoeing is offered in the spring and fall quarters. Those interested in this special course should write to the Dean of Agriculture for details.

AGRICULTURAL PROJECT FACILITIES AT SAN LUIS OBISPO

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

The college foundation has some of the best breeding flocks and herds of livestock in the State. Many show champions have come from the beef herd, which includes Herefords, Angus, and Shorthorns, offsprings of which are sold to the students. All necessary equipment for beef cattle production—barns, dehorning and loading chutes, corrals, stock horses, etc., is available.

The college foundation swine herd consists of three major breeds—Poland Chinas, Duroc-Jerseys, and Berkshires. The facilities include a 12-unit farrowing house and outside lots and pastures for the brood sows. In addition there are 20 feeder units for student projects having a capacity of approximately 20 market hogs per unit. Student projects market between 700 and 800 fat market hogs each year.

The foundation breeding flock of sheep is made up of four breeds—Hampshire, Suffolk, Corriedale, and Southdown. 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. There are student project facilities for approximately 400 to 500 market lambs that are fed for market each year. 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 part of the college farm.

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 four greenhouses and three lath houses together with a sales unit and two large labs.

* 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 100 is replaced by CP 100 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.
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 Crops Department is well equipped with all types of machinery found on mechanized farms in California. All of the farming operations are carried on by 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 at the college 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.
The Agricultural Business Management curriculum is designed to prepare students for the many farm related agricultural businesses and government agencies serving the farmer. Other employment fields include agriculture teaching.

In contrast to the self-sufficient farm owner of 100 years ago, the modern farmer is primarily a specialist who confines his operations largely to producing crops and livestock. He depends upon farm related businesses for increasing amounts of fertilizer, insecticides, machinery and equipment, commercial feeds, capital and other production supplies. At the same time, he relies more heavily on off-farm businesses for processing and merchandising his products. He uses more commercial and public agency advisory and informational services.

As a result of such trends, farm related business functions involving agricultural products provide excellent career opportunities for those who are trained in the business principles and procedures necessary for organizing, managing and representing the expanding farm related businesses and industries.

While the Agricultural Business Management curriculum is based upon a firm foundation in production agriculture, the program brings together in clear perspective both the agricultural and business training required for success in farm related business careers.

Students majoring in Agricultural Business Management have the opportunity of selecting electives to obtain a broad background in agriculture or technical skills in specialized agricultural fields according to their interests and needs.

The curriculum emphasizes the “learn by doing” method pioneered at the college level by Cal Poly with students taking part in many learning activities involved in the production, processing and merchandising of crops and livestock from Cal Poly’s 3,000 acre ranch campus.

**CURRICULUM IN AGRICULTURAL BUSINESS MANAGEMENT**

<table>
<thead>
<tr>
<th>Freshman</th>
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* See General Education list.

** At least 36 units must be chosen with the approval of the adviser from courses in the Agriculture Division. Twelve of the 36 units must be in a single agriculture major.
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**DESCRIPTIONS OF COURSES IN AGRICULTURAL BUSINESS MANAGEMENT**

**ABM 101 Introduction to Agricultural Business Management (3)**

Changes occurring in agriculture, careers in commercial agricultural businesses and public agricultural service agencies, development and growth of farm related industries, kinds of agricultural businesses, operational characteristics of commercial agricultural industries. 3 lectures.

**ABM 102 Agricultural Marketing Programs in California (3)**

California marketing orders and agreements, integration and contract farming; their implications and effects on farming and marketing institutions. 3 lectures.

* See General Education list.

** At least 36 units must be chosen with the approval of the adviser from courses in the Agriculture Division. Twelve of the 36 units must be in a single agriculture major.
Agriculture Division

ABM 103 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.

ABM 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 non-agricultural customers. Selling aspects involved in marketing of farm products by farm related businesses. 3 lectures.

ABM 202 Agricultural Cooperative Organization and Management (3)
Purpose, types and organization of cooperatives. Emphasis on California agricultural cooperatives, their characteristics, operation and problems. 2 lectures, 1 two-hour laboratory.

ABM 203 Agricultural Business Credit and Finance (3)
Agricultural business investment, financial and credit requirements as determined by production of farms and farming area served. Emphasis on financial principles, procedures and problems in establishing and managing the agricultural business and serving farm and farm related businesses. 3 lectures.

ABM 230 General Agricultural Business Management (3)
Agricultural business growth, opportunities, functions and services, organization and operation. Emphasis on California agricultural businesses and industries. A general course for non-Agricultural Business Management majors. 3 lectures.

ABM 301 Agricultural Business Management and Government Policy (3)
Agricultural business policy, objectives and formulation, resource allocation and production adjustments; government subsidies, acreage controls, storage, crop insurance, forward prices, consumer subsidies, economic, social and political influences. 3 lectures.

ABM 302 Agricultural Business Sales Management (3)
Organizing and coordinating agricultural machinery, crop, livestock, poultry, fertilizer, insecticide and other farm and farm related sales and service programs. Planning, policies, pricing, sales control records, training salesmen, advertising, supervising salesmen, and evaluating sales performance as related to needs and demands of farm and farm related agricultural businesses. 3 lectures. Prerequisite: ABM 201

ABM 303 Agriculture—Consumer Relationships (2)
Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to non-farm persons. Consumer education programs and procedures. 2 lectures.

ABM 305 Farm Group and Commodity Organizations (2)
Survey of farmers' efforts to study and seek solutions to individual and industry-wide problems through organized group effort. Major farm organizations, policies and services to members. 2 lectures.

ABM 306 Government Agricultural Service Agencies (2)
Programs and services performed by government agencies on behalf of farm and off-farm agricultural industries. Designed for students who may use services of, who may advise others of such services, or who may seek a career in such agencies. 2 lectures.
ABM 321 Agricultural Property Management and Sales (4)

Land economic, legal and real estate principles in the investment, development, leasing, mortgaging and transferring of agricultural and urban real estate. 3 lectures, 1 two-hour laboratory.

ABM 322, 323 Advanced Agricultural Business Management (4) (4)

Agricultural business management with primary emphasis on economic analysis and cost accounting procedures, policy formation, financial, fiscal and material resources management. Includes budgets, business statements and other planning and control procedures. Agricultural business insurance, taxation, office management, and related phases in management of the agricultural business firm. 3 lectures, 1 two-hour laboratory. Prerequisite: ABM 203

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

Individual or group investigation. Research, studies or surveys resulting in preparation of reports and materials of value to the student. Prerequisite: Permission of department head. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ABM 402 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. 3 lectures. Prerequisite: Senior standing.

ABM 403 Agricultural Labor Relations and Personnel Management (3)

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. 3 lectures. Prerequisite: Senior standing.

ABM 412 Wholesaling and Retailing Agricultural Commodities (3)

The field of wholesaling and retailing agricultural commodities including auctions, commission houses, commission merchants, food brokers, carlot receivers, jobbers, shippers and supply houses. Principles of buying and selling; terms and trade customs. 3 lectures.

ABM 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: ABM 203, 323

ABM 443 Field Studies in Agricultural Business Management (2)

California commercial agricultural businesses. Visitation to selected industries. Organization, operation, services and problems considered. One week in field and one week laboratory analysis and evaluation of data obtained on the trip. Prerequisite: Senior standing or permission of instructor.

ABM 461, 462 Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

ABM 463 Undergraduate Seminar (2)

Student presentation and leadership; group participation under faculty supervision on new agricultural business developments. 2 lectures.

ABM 581 Graduate Seminar in Agricultural Business Management (1-3)

Current trends and characteristics of agricultural business and industry as related to the teaching of Vocational Agriculture. Vo-Ag graduate opportunities, place and problems in becoming established in farm related businesses. 1 to 3 lecture-discussions.
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 undergraduate and graduate students. The basic technological, scientific, and broad general education course work for agriculture teaching candidates is offered throughout the Agriculture Division and other divisions of the college.

Undergraduate students interested in preparing to become teachers of agriculture must enroll in an agriculture major and obtain a B.S. degree in agriculture. The undergraduate major may be selected in any of the agricultural science, production or management fields. Graduate students will enroll as majors in agricultural education.

Undergraduate agriculture teacher candidates will need to use judiciously the elective time available in the major curriculum to complete courses additionally required for the teaching credential which are not normally specified in the undergraduate major. Undergraduate students preparing for the teaching of agriculture will be advised primarily by an adviser in the selected agriculture major. They may pursue a program in agricultural education with the assistance and approval of their major department adviser in course planning and scheduling. Curriculum sheets showing such programs for each of the majors are available from department advisers and the Agricultural Education Office.

Guidance in course selection to meet teaching credential requirements in agricultural education is available through advisers in the Agricultural Education Office. Students preparing for the teaching of general agriculture may secure such information from this same office.

Candidates for the agriculture teaching credential will apply for admission to the teacher education program in agriculture according to the procedures outlined under the section ADMISSION TO CANDIDACY FOR TEACHING CREDENTIALS of this catalog.

Information relative to the purposes, requirements, and procedures for the Master of Arts Degree in Education with a concentration in Agriculture may be found under the heading THE MASTER OF ARTS DEGREE in this catalog.

**DESCRIPTIIONS OF COURSES IN AGRICULTURAL EDUCATION**

**Ag Ed 302 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. Visits to high school agriculture departments. 2 lectures.

**Ag Ed 403 Teaching Plans in Agricultural Education (3)**
Preparation for student teaching. Orientation to classroom situation. Development of teaching units and daily lessons. Class demonstrations in teaching procedures. 2 lectures, 1 activity period.

**Ag Ed 520 Program Development in Agricultural Education (3)**
Study of career opportunities in agriculture. Program development in such areas as the Future Farmers of America. Supervised practice. Development of up-to-date approaches in an integrated program. Operating policies and procedures. 3 lectures.

**Ag Ed 521 Curriculum and Methods in Agricultural Education (3)**
Principles and methods of determining course objectives, content, and calendar. Methods, procedures, and materials adapted for use by the teacher in classroom, shop, and field instruction. Concurrent with student teaching. 3 lectures.
Ag Ed 522 Group Study in Agricultural Mechanics (5)
Agricultural mechanics in the vocational agriculture programs. Organizing a course of study and implementation of program. Demonstrations, teaching and analysis of teaching techniques. 3 lectures, 2 laboratories.

Ag Ed 523 Adult and Continuation Education in Agriculture (2)
Organization, history, philosophy, administration and teaching of classes for out-of-school youth and adults. Surveys and plans for development of rural and urban adult education programs. Young Farmer program. Techniques and methods of leadership. 2 lectures.

Ag Ed 524 Group Study in Agriculture (6)
Modern developments and trends in the field that apply to agricultural education. Emphasizes the economic and management aspects of agriculture. 3 lectures, 3 activities. Open to advanced students in Agricultural Education.

Ag Ed 525 Student Teaching in Vocational Agriculture (12)
Off-campus assignment under the direction of a selective supervising teacher of vocational agriculture. Participation in all phases of the agricultural education program. Principles and practices in departmental organization and administration. Prior approval is necessary.

Ag Ed 580 Special Problems in Agricultural Education (1-3)
The student will select, plan, and develop under direction and supervision a specific problem of value to the program of agricultural education. Research, planning, and development may be through group or individual study. Total credit limited to nine units with not more than three units in any one quarter.

Ag Ed 621 (A-Z) Technical Agricultural Developments (1½)
Group study of new scientific and technical developments in agriculture. Offered during a one week summer period for teachers of agriculture.

Ag Ed 631 (A-Z) Professional Conference in Agriculture (1½)
A series of lectures, seminars, and discussions of problems in agricultural education and developments in agriculture led by specialists in the field. For professional improvement of teachers of agriculture. Offered during a one week summer period.
A student in this department may choose one of two majors.

1. Agricultural Engineering. This major prepares students for engineering positions with farm machinery and equipment companies, manufacturers and distributors of irrigation equipment, government agencies such as the Soil Conservation Service and other positions requiring technical training in Agricultural Engineering. Concentration of study will be directed either toward Power and Machinery or Soil and Water.

2. Mechanized Agriculture. This major gives the student broad agricultural training with emphasis on the applied mechanical phases of agriculture. This curriculum is intended for the student who plans to own or manage a farm, teach vocational agriculture with emphasis on farm mechanics, or do sales and service work in the farm machinery and equipment field.

This department also gives training in the mechanical and engineering phases of agriculture to students majoring in other departments of the Agriculture Division.

Two buildings containing eight shops and laboratories and two classrooms, together with a large modern farm machinery and equipment building provide excellent facilities. A wide variety of makes, models, and types of tractors and farm machinery is available for class use and students are provided with ample opportunity for the application of mechanical and engineering know-how to practical production problems in using the entire 2,850-acre college farm as a laboratory.

The curriculum in agricultural engineering is recognized as a professional curriculum by the American Society of Agricultural Engineers. The student branch of the ASAE offers an active program of professional and extra-curricular events.

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

**CURRICULUM IN AGRICULTURAL ENGINEERING**

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<td>General Psychology (Psy 202)</td>
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<td>*Electives and courses to complete major</td>
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* At least 19 units shall be chosen with the approval of the adviser in the concentration area of Power & Machinery or Soil & Water. An additional 10 units must be selected from courses in the Agriculture Division.

** To be selected from the General Education List.
## Agriculture Division

**Curriculum in Mechanized Agriculture**

### Freshman

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<th>Course</th>
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<tr>
<td>Introduction to Agricultural Engineering (AE 100)</td>
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<tr>
<td>Agricultural Mechanics (AE 128)</td>
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<td>Tractors (AE 141)</td>
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<td>Agricultural Machinery (AE 221, 222)</td>
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<td>Soils (SS 121)</td>
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<td>Animal Production</td>
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<td>Plant Production</td>
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<tr>
<td>Agricultural Mathematics (Math 102, 103, 114)</td>
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<td>Language Communication (Eng 104, 105)</td>
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<td>Engineering Drafting (ME 151, 152, 153)</td>
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<td>Machine Shop (MS 151)</td>
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<td>Shop Processes (Weld 141, 142)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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Total Freshman Units: 17½

### Sophomore

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<tr>
<td>Agricultural Power (AE 234)</td>
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<td>Farm Building Construction (AE 231)</td>
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<td>Engineering Surveying (AE 237, 238)</td>
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<td>Irrigation (AE 340)</td>
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<td>Mathematics (Math 115)</td>
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<td>Welding (Weld 156, 254)</td>
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Total Sophomore Units: 16½

### Junior

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<td>Farm Building Planning (AE 332)</td>
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<td>Agricultural Products Handling (AE 323)</td>
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<td>Agricultural Power (AE 335)</td>
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<td>Farm Equipment Projects (AE 344)</td>
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<td>Soil Conservation (SS 202)</td>
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<td>Technical Writing (Eng 219)</td>
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<td><strong>Literature, Philosophy</strong></td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Business Law (Bus 301)</td>
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Total Junior Units: 17

* 15 units of electives shall be selected from courses in the Agriculture Division.

** See General Education list. Include at least one course in literature.
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<td>Farm Equipment Industry Management (AE 321)</td>
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<td>Rural Electrification (AE 324, 325)</td>
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<td>Senior Project (AE 461, 462)</td>
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<td>Undergraduate Seminar (AE 463)</td>
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<td>Ag Business Sales and Service (ABM 201)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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**DESCRIPTIONS OF COURSES IN AGRICULTURAL ENGINEERING**

**AE 100 Introduction to Agricultural Engineering (1)**
Agricultural Engineering as a profession. Technical areas and job opportunities. Departmental orientation. 1 lecture.

**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)**
Selection and evaluation of production equipment associated with the student's major. Study of specifications and plans. Construction of production equipment; fences, gates and mobile equipment. Students register for this course by sections according to their specific majors. 1 lecture, 1 laboratory. Prerequisite: AE 121

**AE 128 Agricultural Mechanics (2)**
Selection of materials for farm construction. Plans interpretation and bills of materials. Development of skills in wood and metal working. Concrete proportioning and quality tests. 1 lecture, 1 laboratory. Prerequisite: AE 133 or ME 151 concurrent.

**AE 130 Irrigation Practices (2)**
A general course in the fundamentals of conservation irrigation on the farm; resources inventorying; methods of application; farm irrigation; distribution system planning and construction; simple design and construction of farm irrigation structures; field practice in system layout, construction, and operation. 1 lecture, 1 laboratory. Prerequisite: SS 121

**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. 1 lecture, 1 laboratory. Prerequisite: Math 102

**AE 133 Farm Drafting (2)**
Freehand lettering, dimensioning, use of drafting equipment. Orthographic projections. Isometric and cross section drawings. Exploded sections. Freehand sketching. 1 lecture, 1 laboratory.

**AE 134 Farm Electrification (3)**
A general course in the fundamentals of electric wiring and code regulations; selection, installation and maintenance of electric motors as used in agriculture. For Agriculture Division students other than degree majors in Agricultural Engineering. 2 lectures, 1 laboratory. Prerequisite: Math 103

*15 units of electives shall be selected from courses in the Agriculture Division.*
AE 138  Farm Engines (2)
Fundamental principles of gasoline and diesel engines and their accessories. Tuneup, adjustment, minor overhaul, and servicing. Fuels and lubricants. For Agriculture Division students other than Agricultural Engineering. 1 lecture, 1 laboratory. Prerequisite: AE 141

AE 141  Tractors (2)
Field and shop practice in the operation, service, adjustment, and function of the component parts of the modern farm tractor, including wheel and track types with gasoline and diesel power units. A field introduction to primary and secondary tillage equipment, hydraulic systems, hitching, weight transfer principles, and economics of power management. 1 lecture, 1 laboratory.

AE 221  Agricultural Machinery (2)
Selection and management of farm power and machinery. Operation, adjustment, and maintenance of primary and secondary tillage implements; seeding, planting, and fertilizing implements; pest and weed control equipment. Emphasis on design characteristics, adaptability, and versatility factors. 1 lecture, 1 laboratory. Prerequisite: AE 141, Math 102 or 117

AE 222  Agricultural Machinery (2)
Selection, operation, adjustment, and maintenance of haying, harvesting and crop handling equipment. Emphasis on design characteristics, adaptability, and versatility factors. Study of machine efficiencies. Problems on farm power and machinery management. 1 lecture, 1 laboratory. Prerequisite: AE 221

AE 228  Cotton Ginning (4)
Plant layout and materials flow patterns. Function, operation, trouble shooting, maintenance and repair of ginning equipment. Electrical, pneumatic and hydraulic systems. Product quality control; sampling procedures and mechanisms. 3 lectures, 1 laboratory.

AE 230  Farm Blacksmithing (2)
Fundamentals of forging and its application to agriculture. New and repair work involving bending, shaping, hardening, tempering, and annealing. 1 lecture, 1 laboratory.

AE 231  Farm Building Construction (3)
Development of practical skills in farm carpentry and light construction. Selection of materials. Farm buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: AE 121 or AE 128

AE 234  Agricultural Power (3)
Application, transmission and measurement of power. Fundamental principles of internal combustion engines and their application to agriculture. 2 lectures, 1 laboratory. Prerequisite: AE 141

AE 236  Principles of Irrigation (4)
Plant-soil-water relationships. Measurement of water. Methods of application of irrigation water. Drainage. Water organizations and water law. For Agricultural Engineers. 3 lectures, 1 laboratory. Prerequisite: Math 118, AE 237

AE 237  Engineering Surveying (2)
Selection, care, testing, and use of tapes and levels. Keeping and calculating field notes; land measurement by tape; practice in differential, profile, and contour leveling, and the plotting of profiles. Earth volume by the borrow pit method. 1 lecture, 1 field period. Prerequisite: ME 151, Math 114 or 117

AE 238  Engineering Surveying (2)
Care and use of transit; measurement of horizontal and vertical angles, distance by stadia, straight line and distance by offset, area by tape and transit traverse and topographic 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 312 Hydraulics (4)
Static and dynamic characteristics of liquids in open and closed channels. 3 lectures, 1 laboratory. Prerequisite: Phys 132, Math 202

AE 315 Hydrology (3)
Collection, organization, and use of precipitation, evaporation, and runoff data. Principles of flood routing, stream flow, and ground water conservation. The hydrograph. 3 lectures. Prerequisite: SS 121

AE 321 Farm 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. 2 lectures, 2 laboratories. Prerequisite: AE 222

AE 322 Principles of Agricultural Machinery (3)
Principles of selection and evaluation of agricultural power units and machines. Soil-equipment mechanics and tractor-implement combinations. 2 lectures, 1 laboratory. Prerequisite: AE 234

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: Math 103 or 117, junior standing or consent of instructor.

AE 324 Rural Electrification (3)
Principles of wiring farm buildings and farmstead wiring layout. Materials, code regulations, electrical measurements and rates applicable to various farm uses. Power distribution and application of DC and AC circuit fundamentals to agricultural situations. 2 lectures, 1 laboratory. Prerequisite: Physics 123 or 133

AE 325 Rural Electrification (3)
Single-phase and three-phase electric motors and protective devices for agricultural use. Identification, selection, installation, and maintenance of various types. Operating characteristics and drives. Applications of electronic controls to agriculture. 2 lectures, 1 laboratory. Prerequisite: AE 324

AE 331 Irrigation Systems (3)
The design of surface and sprinkler irrigation systems. Land grading calculations for optimum grades and minimum soil moving consistent with soil conditions and costs. 2 lectures, 1 laboratory. Prerequisite: AE 236

AE 332 Farm Building Planning (3)
Functional planning of farm buildings. Farmstead layouts. Environmental factors affecting crop and animal housing. Working drawings and cost estimates. 2 lectures, 1 laboratory. Prerequisite: Junior standing and a course in drafting.

AE 335 Agricultural Power (3)
Principles and applications of gasoline, diesel, and LPG engines to agriculture. Service, tune up, trouble shooting and repair of these engines and their accessories. 2 lectures, 1 laboratory. Prerequisite: AE 234 or 138

AE 336 Agricultural Power (3)
Thermodynamic principles as applied to internal combustion engines. Theory of combustion. Fuels and lubricants. Power and its measurement. Factors affecting horsepower output and engine efficiency. Power transmission. Automotive electrical systems. 2 lectures, 1 laboratory. Prerequisite: AE 335, Phys 133
AE 338  Process Instrumentation and Control (3)
Types and application of transducers, receivers, recorders and automatic controls in agriculture and agricultural processing. 2 lectures, 1 laboratory. Prerequisite: AE 323, junior standing or consent of instructor.

AE 340  Irrigation (4)
Fundamental principles and practices of irrigation. Soil-moisture relationships, water measurement, methods of irrigation, crop requirements, farm irrigation structures, pumps and pumping, and problems of the irrigation farmer. 3 lectures, 1 laboratory. Prerequisite: Math 103, SS 121

AE 344  Farm Equipment Projects (3)
Principles, materials and construction of specialized agricultural equipment. 1 lecture, 2 laboratories. Prerequisite: AE 122 or 128

AE 400  Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation, design or management problems in the field of agricultural engineering. Prerequisite: permission of department head. Total credit limited to 4 units with a maximum of 2 units per quarter.

AE 414  Irrigation Engineering (4)
Problems of irrigation water distribution and supply found in irrigation districts or large farms. The influence of soils and crops in determining water deliveries. Rates of water use, open and closed conduits, pumps, reservoirs, costs and economics of efficient water delivery and use. 3 lectures, 1 laboratory. Prerequisite: SS 202, AE 312, AE 331

AE 421  Equipment Engineering (3)
Design and construction of specialized farm equipment. 1 lecture, 2 laboratories. Prerequisite: ME 153, MS 142, Weld 156, Phys 202, ME 203

AE 422  Agricultural Machine Design (3)
Analysis and use of fundamental machine elements and their application to agricultural machinery. 2 lectures, 1 laboratory. Prerequisite AE 221, 223, 421

AE 433  Farm Building Design (3)
Functional planning of farm buildings. Environmental control factors. Loading and stress analysis. Structural design with steel and timber. 2 lectures, 1 laboratory. Prerequisite: ME 203 or AE 332

AE 434  Reinforced Concrete (3)
Mechanics of reinforced concrete. Design of beams, columns, floor systems, foundations and retaining walls. 2 lectures, 1 laboratory. Prerequisite: AE 433

AE 435  Drainage (3)
The engineering factors in the design of drainage system for agricultural and urban areas. 2 lectures, 1 laboratory. Prerequisite: AE 312 or AE 340

AE 437  Conservation Engineering (3)
Principles of soil and water conservation including the fundamentals of soil mechanics used in the design of compacted earth fills. Practice in the design of important types of soil and water conservation structures. 2 lectures, 1 laboratory. Prerequisite: SS 202, AE 312, AE 315

AE 443  Internal Combustion Engine Diagnosis (2)
The use of modern engine testing equipment in the evaluation and analysis of performance variables such as: detonation, pre-ignition, air-fuel ratio, combustion efficiency and fuel economy. 1 lecture, 1 laboratory. Prerequisite: AE 335, senior standing
AE 461, 462  Senior Project (2) (2)

Selection and completion of a project under a minimum of 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. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 lectures.

AE 581  Graduate Seminar in Agricultural Engineering (3)

Group study of current problems and recent developments in the field. Relationship of Agricultural Engineering to the teaching of vocational agriculture. 3 lectures.
ANIMAL HUSBANDRY DEPARTMENT

Department Head, Lyman L. Bennion

Russell Anderson  Spelman Collins  Roy M. Harris
Richard Birkett  James R. Flanagan  Ralph Hoover
Emmett Bloom  Frank W. Fox, Jr.  Richard Johnson
Thomas P. Brannum  William Gibford  John V. Stechman
LaVerne Bucy  Gordon L. Gibbs  Robert Wheeler

The objective of the Animal Husbandry Department is to train men for the occupation of farming where beef cattle, 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 foremen or managers.

Livestock feeding yards, feed mills, stockyard companies, meat packers, commission firms, and other organizations servicing the livestock industry are sources of employment for graduates. Other employment fields include agricultural teaching, agricultural extension work, and agricultural research.

Concentration of study will be directed to one of three areas: Production, Management, or Science-Teaching.

Further aims and objectives of the Animal Husbandry Department are to give students practical training in livestock farming and range management. The department maintains herds of three breeds of beef cattle, four breeds of sheep, three breeds of swine, and Thoroughbred and Quarter horses. These are used for laboratory and field study of management, feeding, breeding, and marketing.

Students are encouraged to carry on a project program of feeding, management, and marketing livestock through facilities furnished by the California State Polytechnic College Foundation. Approximately 900 hogs, 400 beef cattle, and 800 sheep are fed and marketed by students each year. An abattoir provides facilities for training in slaughtering of meat animals and cutting, curing, and grading of meats. Students interested in the two-year technical certificates should refer to the introductory statement for the Agriculture Division which describes this program. Detailed curriculum information is available from the department head.

CURRICULUM IN ANIMAL HUSBANDRY

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<td>Feeds and Feeding (AH 101, 102)</td>
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<td>Market Beef Production (AH 121)</td>
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<td>Elements of Swine Production (AH 122)</td>
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<td>Elements of Sheep Production (AH 123)</td>
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<td>Agricultural Mechanics (AE 121, 122)</td>
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<td>Language Communication (Eng 104, 105)</td>
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* At least 18 units shall be chosen with the approval of the adviser in one of the concentration areas of Production, Management, or Science-Teaching.
### Sophomore

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<td>Commercial Beef Production (AH 222)</td>
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<td>Swine Husbandry (AH 223)</td>
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<td>Anatomy and Physiology (VS 123)</td>
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<td>Forage Crops (CP 123)</td>
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<td>Soils (SS 121)</td>
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**Junior**

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<td>Beef Husbandry (AH 323)</td>
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**Senior**

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**Total** 15½ 15½ 16½

### DESCRIPTIONS OF COURSES IN ANIMAL HUSBANDRY

**AH 100 Introduction to Animal Husbandry (1)**

Introductory course for animal husbandry students. Importance of animal production to the state and national economy. Areas of production. Animal husbandry as a career; technical areas and job opportunities. Orientation to student livestock project program in animal husbandry. 1 lecture.

* At least 18 units shall be chosen with the approval of the adviser in one of the concentration areas of Production, Management, or Science-Teaching.

* * To be selected from the General Education list.

**++ To be selected from any 300-400 series course in ABM or FM.**
Agriculture Division

AH 101  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; the use of byproduct feeds. 2 lectures.

AH 102  Feeds and Feeding (3)
The digestion and utilization of feeds; feeding standards and computation of standard rations for livestock; economy in feeding, and purchasing feeds by nutritive values; important vitamins and minerals and feed sources thereof. 2 lectures, 1 laboratory. Prerequisite: AH 101

AH 121  Market Beef Production (4)
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, 1 laboratory.

AH 122  Elements of Swine Production (4)
History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practices of swine feeding and management. 3 lectures, 1 laboratory.

AH 123  Elements of Sheep Production (4)
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, 1 laboratory.

AH 131  Basic Equitation (3)
Grooming, saddling, bridling, mounting, seat and hands. Horseback riding both bareback and under saddle. Basic equitation for students with no previous experience. Students will be expected to provide for the maintenance of stock. 1 lecture, 2 laboratories.

AH 221  Sheep Husbandry (4)
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, 1 laboratory. Prerequisite: AH 102, 123

AH 222  Commercial Beef Production (4)
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, 1 laboratory. Prerequisite: AH 102, 121

AH 223  Swine Husbandry (4)
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, 1 laboratory. Prerequisite: AH 102, 122

AH 226  Livestock Judging (2)
Application of visual appraisal techniques to the selection of beef cattle, sheep, swine and horses. 2 laboratories.

AH 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, Bot 121, AH 121 or 230
AH 230 General Animal Husbandry (4)
For non-animal husbandry majors. Selection, feeding, and management of sheep, swine, and cattle, and their uses on California farms. 3 lectures, 1 laboratory.

AH 232 Elements of Horse Production (3)

AH 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.

AH 304 Animal Breeding (4)
Physiology of reproduction, application of genetics to animal breeding. Systems of mating animals, the use of inbreeding, crossbreeding, and selection as it applies to farm animals. 3 lectures, 1 laboratory. Prerequisite: Bio 303

AH 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: AH 102, 121, 222

AH 329 Range Ecology (3)
Ecological factors of range plant environment, succession, application of ecology to rangeland. 2 lectures, 1 laboratory. Prerequisite: AH 229

AH 332 Range Technology (3)
Range survey, inventory, analysis and development of plans for effective improvement and utilization of rangeland. 2 lectures, 1 laboratory. Prerequisite: AH 229

AH 333 Horse Husbandry (3)
Horse breeding farm management. Care of stallion, mares, and offspring. Feeding and breeding schedules. Records and office procedure. Bloodlines, systems of mating. Extended equitation and fundamentals of horsemanship. 2 lectures, 1 laboratory. Prerequisite: AH 232

AH 334 Feed Mill Operation (3)
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. 2 lectures, 1 laboratory. Prerequisite: AH 101 and 1 year production courses, or AH 230, PH 230 or DH 230

AH 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: AH 102, Chem 328

AH 434, 435 Specialized Horse Enterprises (3) (3)
Training and gentling, driving and ground work with young horses and use of advanced equipment for extended training. Training of the high schooled horse, pleasure horse, jumping horse, and stock horse, with related skills in cattle work. Advanced equitation. Students required to provide for maintenance of stock. 1 lecture, 2 laboratories.

AH 441 Advanced Livestock Judging (2)
Intensive practice in livestock judging in preparation for livestock judging team to compete in intercollegiate contests. 2 laboratories. Prerequisite: AH 226
Selection and completion of a project under a minimum of 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.

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 his chosen field. 2 lectures.

Current findings and problems in the field of animal nutrition. Effects of new experimental research on the livestock industry. 3 lectures.

Current findings and research problems in the field and their application to the industry. 3 lectures.
Two major curricula are offered by the Crops Department and are designed to prepare students for field, fruit, or vegetable crops production. A student in the Crops Production major may elect to concentrate in either Agronomy or Vegetable Crops in the junior and senior years. Placement opportunities include sales and service in seeds, fertilizer, weed and pest control, production fieldmen, and in shipping and processing. Private or corporate crop production is a major employment opportunity as is governmental employment in Agronomy, Horticulture, Agricultural Inspection and Crop Grading.

The Fruit Production major qualifies graduates for orchard and vineyard management and for related employment such as cannery or packing house fieldmen or fruit inspectors. Deciduous fruits, nut crops, citrus, avocados, grapes, berries and less common fruit species are studied. Fresh fruit handling and quality control receive major attention.

Graduates from both majors have entered the vocational agricultural teaching and the agricultural extension service fields.

Students interested in the two-year technical certificate should refer to the Agriculture Division introductory statement. Details of the program are available through the department head.

The department has 25 acres of productive orchard and vineyard with 100 varieties represented. Additional non-bearing acreage is available for class use and new plantings are under way. Student production enterprises in vegetable crops occupy about 30 acres and in field crops about 140 acres are devoted to this type of production. With an additional 500 acres of college farm cropland also available, there is ample opportunity to gain experience through part-time employment or profitable production projects. All departmental majors are encouraged to carry a project.

The use of packing and grading equipment has greatly enhanced the technological phases of instruction. Field trips are extensively used to supplement instruction concerning crops not common to the San Luis Obispo area.

**CURRICULUM IN CROPS PRODUCTION**

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* At least 18 units shall be chosen with the approval of the adviser in the concentration area of Agronomy or Vegetable Crops.
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* At least 18 units shall be chosen with the approval of the adviser in the concentration area of Agronomy or Vegetable Crops.

** See General Education list. Include at least one course in literature.

† To be selected from the General Education list.

†† To be selected from any 300-400 series course in ABM or FM.
## CURRICULUM IN FRUIT PRODUCTION

### Freshman

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Total Credits: 17½

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Total Credits: 16 ½

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Total Credits: 16

* To be selected from the General Education list.
### Agriculture Division

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**Total Credits:** 16 16 16

### DESCRIPTIONS OF COURSES IN CROPS PRODUCTION

**CP 100 Principles of Crop Pest and Disease Control (5)**
Symptoms, identification, and methods of control for the principal diseases and pests of commercial crops and ornamentals. Field practice in operation of spraying and dusting equipment. 4 lectures, 1 laboratory. For technical students only.

**CP 101 Introduction to Farm Crops (1)**
Introductory course for freshmen crops majors. Statistical importance of crop production in California and the major production areas. Job opportunities. Orientation to the crops curricula and to the project enterprise program. 1 lecture.

**CP 121 Farm Crops of California (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 and sugar beets. 3 lectures, 1 laboratory.

**CP 122 Row Crops (4)**
Adaptation, production, utilization of major row crops such as potatoes, sweet corn, tomatoes, artichokes, garlic, onions, asparagus, and peas. 3 lectures, 1 laboratory. Prerequisite: CP 121

**CP 123 Forage Crops (4)**
Production, harvest, and utilization of principal California forage crops. Identification and utilization of range plants studied in the field. 3 lectures, 1 laboratory. Prerequisite: Bot 121

**CP 126 Combine Harvest Crops (4)**
Production, adaptation, distribution, and utilization of major crops harvested by combine including cereals, large seeded legumes, milo, flax, corn, and safflower. Field trips to major California cereal production areas. 3 lectures, 1 laboratory. Prerequisite: CP 121

**CP 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.

**CP 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.

**Notes:**
- To be selected from any 300-400 series courses in ABM or FM.
- See General Education list. Include at least one course in literature.
CP 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: CP 122 or CP 126

CP 303 Agricultural Code of California (3)
Services and procedures of the California Agricultural Code. Provisions of the Agricultural Code and other laws affecting agricultural industries, particularly plant industries. Grain warehouse inspection, seed inspection, county agricultural departments, plant quarantine and standardization. 3 lectures.

CP 304 Plant Breeding (3)
Application of principles of plant improvement through selection, hybridization, and utilization of hybrid vigor. 2 lectures, 1 laboratory. Prerequisite: Bio 303

CP 305 Agricultural Inspection and Services (3)
Purpose and functions of county departments of agriculture and the related functions within the State Department of Agriculture. Basic background material to qualify students for the eight specific County Inspectors Examinations. 3 lectures. Prerequisite: CP 303

CP 321 Crop Disease and Pest Control (3)
Methods of combating diseases, insects, and rodent pests of important California crops including sprays, dusts, fumigants, poisons, cultural and sanitary controls. 2 lectures, 1 laboratory.

CP 322 Crop Technology (4)
Grades and laboratory tests for quality of California cereal and vegetable crops. The effects of harvesting, storage, and quality control on market value and processing. 3 lectures, 1 laboratory. Prerequisite: CP 122 and CP 126

CP 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 324

CP 330 Irrigated Pasture and Range (4)
Identification, production, utilization of irrigated pasture crops and range plants. A study of grazing systems and the merits of mixtures and non-mixtures. A field trip to a production area may be required. 3 lectures, 1 laboratory. Prerequisite: CP 121 or CP 230

CP 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group study in special areas. Total credit limited to 4 units. 1 or 2 meetings per week. Prerequisite: Permission of Department Head.

CP 410 Crops Physiology (3)
Practical studies in plant nutrition, soil-water-plant relationships, seed physiology, growth regulators, insecticide reactions, and controlled environments. 3 lectures. Prerequisite: Bot 122, SS 221, Bot 126 or 223, and Chem 328

CP 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.

CP 421 Oil and Fiber Crops (4)
Culture, harvest, grading, and marketing of cotton, flax, safflower, castor beans, minor oil and fiber crops. Field trips to major centers of production and marketing are required. 1 laboratory. Prerequisite: CP 121 or 230
Selection and completion of a project under a minimum of 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.

Oral presentation and leadership of group study on recent developments in the major field. 2 lectures.

Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 lectures.

**DESCRIPTIONS OF COURSES IN VEGETABLE CROP PRODUCTION**

VC 230  General Vegetable Crops (4)
Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry. 3 lectures, 1 laboratory.

VC 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. 3 lectures, 1 laboratory. Prerequisite: CP 121

VC 324  Harvesting, Packaging and Marketing Vegetable Crops (4)
Harvesting methods and procedures; current handling and packaging techniques; containers; storage; and grades and grading for fresh market vegetables. 3 lectures, 1 laboratory. Prerequisite: VC 232

VC 326  Vegetables for Processing (4)
Production principles and methods; cultural and harvesting practices as applied to vegetable crops grown primarily for processing. Emphasis will be on planting schedules, field sampling, maturity tests, and forecasting crop maturity. 3 lectures, 1 laboratory. Prerequisite: CP 121

VC 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. 3 lectures, 1 laboratory. Prerequisite: CP 121, CP 122 or VC 232

**DESCRIPTIONS OF COURSES IN FRUIT PRODUCTION**

FP 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.

FP 131  Pomology (4)
History and outlook for California fruit growing. Apple, peach, pear and prune production practices. Field laboratories in harvesting, grading and packaging of college orchard products. 3 lectures, 1 laboratory.

FP 132  Pomology (4)
Planting and planning the deciduous orchard. Apricot, cherry, fig, olive and plum production practices with special emphasis on pruning trees and grapevines. 3 lectures, 1 laboratory. Prerequisite: FP 131

FP 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: FP 132
FP 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.

FP 231  Viticulture (4)
A comprehensive study of grape growing utilizing the college plantings for field practice in planting, training and maintaining the vineyard. Varietal identification and use. 3 lectures, 1 laboratory.

FP 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: FP 133 or 230

FP 239  Home Fruit and Vegetable Production (3)
Growing, handling and evaluating fruits and vegetables common to demonstration and Estate plantings. Varietal characteristics and climatic adaptation. 2 lectures, 1 laboratory.

FP 231  Advanced Viticulture (4)
Commercial production practices, mechanization and processing. Management of college planting. Field labor management efficiency studies. Techniques in handling and harvesting. 3 lectures, 1 laboratory. Prerequisite: FP 231

FP 331  Citrus and Avocado Fruit Production (4)
Growing and marketing oranges, lemons, grapefruit, avocados and dates. Minor subtropical fruits also included. Orchard practice. 3 lectures, 1 laboratory.

FP 334  Orchard Disease and Pest Control (4)
Studies and field identification of diseases and insect pests of deciduous fruit trees. Field application of control materials. Operation of modern spraying and dusting equipment. 3 lectures, 1 laboratory. Prerequisite: FP 133 or 230

FP 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: FP 232, 234

FP 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: FP 421

FP 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.
The Dairy Husbandry and Manufacturing Department offers two majors, and its instruction has two primary objectives.

1. To prepare students for efficient economical milk production, including the selection, management, feeding and breeding of dairy cattle.

2. To prepare students for milk and dairy products processing, distribution, sales, quality control, field work and dairy inspection.

The fields of dairy husbandry and dairy manufacturing are closely related, and many dairy enterprises are highly integrated, combining the production, processing and distribution functions. Specialization is required in either husbandry or manufacturing, but the curriculum is arranged so all students receive considerable background in each field. In addition, specific electives in the biological sciences can be selected to qualify for employment in various areas of public health sanitation.

The college dairy farm maintains an outstanding breeding herd of the Guernsey, Holstein, and Jersey breeds of approximately 175 head. It includes several national champion producing cows, leading show animals, and noted sires.

Dairy buildings, erected in 1953, for care and housing of the herd, include a 24-stanchion milk barn, calf and cow shelter barns, bull pens, and an insemination laboratory. A large judging pavilion is provided for judging work. A 12-student housing unit is on the site to house the students working at the dairy. Modern equipment is in use throughout the unit. In addition, a dairy cattle farm of 400 acres provides facilities for students with dairy projects. This farm accommodates 100 head of project cattle owned and cared for by students. There are two 12-student dormitories at this project farm.

Graduates who major in dairy husbandry find employment as herdsmen, farm managers, feed salesmen, fieldmen, vocational agricultural teachers, and in many related fields.

The college creamery is splendidly equipped with the most modern processing equipment. In conjunction with a complete testing and analytical laboratory, it provides the finest of training facilities. Included is a continuous pasteurizing system and a cleaning and sanitizing system.

All milk and products processing is carried out by dairy manufacturing students who thus earn while they learn production techniques. Distribution of finished products is made through an on-campus retail store and the college dining hall.

Dairy manufacturing graduates find a diverse and challenging industry, with unlimited opportunities in such areas as processing, distribution and sales, quality control, field work, and dairy inspection. Students are encouraged to take elective credits in the Business and Engineering departments—thus opening additional careers in management, personnel and sales engineering.

Students interested in the two-year technical certificate should refer to the introductory statement for the Agriculture Division which describes this program. Detailed curriculum information is available from the department head.
## CURRICULUM IN DAIRY HUSBANDRY

### Freshman

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<td>Feeding Dairy Cattle (DH 102)</td>
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<td>Fitting and Showing Dairy Cattle (DH 133)</td>
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<td>Elements of Dairying (DH 121)</td>
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<td>History of Dairy Breeds and Pedigrees (DH 323)</td>
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* To be selected from the General Education list.
** See General Education list. Include at least one course in literature.
### Agriculture Division

#### Senior

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#### CURRICULUM IN DAIRY MANUFACTURING

#### Freshman

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<td>Butter Making (DM 236)</td>
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#### Note

† To be selected from any 300-400 series courses in ABM or FM.
Junior

Condensed and Dry Milk (DM 331) ........................................ 4
Dairy Inspection (DM 332) .................................................. 2
Creamery Records (DM 336) .................................................. 3
Sanitation & Waste Disposal (Fl 232) .................................... 2
Agricultural Marketing (FM 304) ......................................... 3
Principles of Economics (Ec 201) ......................................... 3
American Government (Pol Sc 301) ...................................... 3
Growth of American Democracy (Hist 304) ............................. 3
Industrial Microbiology (Bact 333) ................................. 3
* Literature, Philosophy ....................................................... 3
Agricultural Biochemistry (Chem 328) .............................. 4
General Psychology (Psy 202) ............................................... 3
Electives ............................................................................. 3

Senior

Dairy Plant Management (DM 431) ..................................... 4
Senior Project (DM 461, 462) ............................................. 2
Undergraduate Seminar (DM 463) ......................................... 2
** Management Elective ......................................................... 3
Industrial Management (IR 311) ........................................... 3
Industrial Relations (IR 312) ............................................... 3
U. S. in World Affairs (Hist 305) .......................................... 3
Principles of Accounting (Actg 221, 222) ........................... 4
Electives .............................................................................. 7

DESCRIPTIONS OF COURSES IN 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

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 photography. 1 lecture, 1 laboratory.

DH 142 Dairy Cattle Judging (2)
Selection of dairy cattle with consideration to breed characteristics and conformation. Correlation between type and production. 2 laboratories.

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

* See General Education list. Include at least one course in literature.
** To be selected from any 300-400 series courses in ABM or FM.
Agriculture Division

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. 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 Judging (2)
Advanced practice in the comparative judging of dairy cattle. Detailed scoring and classifying, cattle on conformation with extensive training on giving oral reasons. Visits to breeding establishments and shows. Judging teams may be selected in this class. 1 lecture, 1 laboratory. Prerequisite: DH 142

DH 301 Advanced Dairy Cattle Feeding (2)
Nutrition requirements of dairy cattle. Successful, economical feeding practices. 2 lectures. Prerequisite: DH 102

DH 323 History of Breeds and Pedigrees (4)
Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. Practice in compiling pedigrees. 3 lectures, 1 laboratory. Prerequisite: DH 221

DH 326 Purebred Dairy Herd Management (4)
Methods and problems in establishing, breeding, feeding, and management of a purebred dairy herd and farm. Visits are made to leading purebred dairy farms and to purebred cattle sales. 3 lectures, 1 laboratory. Prerequisite: DH 222, 233, 301, 323

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 AH 121, VS 123 or VS 100

DH 400 Special Problems for Advanced Undergraduates (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.

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 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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 581 Graduate Seminar in Dairy Production (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.
DESCRIPTIONS OF COURSES IN DAIRY MANUFACTURING

DM 132 Ice Cream Making (4)
Calculating and processing ice cream mixes. Proper equipment and methods required to freeze, package, harden and distribute ice cream and related products. Practice in the college creamery as well as inspection of commercial plants. Manufacture of sherbets and ice milk. Survey of the imitation ice cream field, processing of vegetable fats, etc. 3 lectures, 1 laboratory. Prerequisite: DH 121

DM 133 Market Milk (4)
Buildings, equipment and methods used to handle, process and distribute market milk. Judging and grading market milk. Practice in the college creamery and sales room as well as in commercial plants. 3 lectures, 1 laboratory. Prerequisite: DH 121

DM 230 General Dairy Manufacturing (4)
Nontechnical presentation of the methods and problems involved in modern creamery operation. Testing, flavoring and manufacturing butter, various cheeses, ice cream, market milk, and related products. Elective course for non-dairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

DM 232 Cheese Making (4)
Equipment and methods needed to manufacture, package, cure and market various types of cheese. Practice in the college creamery. 3 lectures, 1 laboratory. Prerequisite: DH 121, Bact 221, DM 133

DM 233 Dairy Products Judging (2)
Theory and practice in the scorecard grading of butter, cheese, ice cream, cottage cheese, and market milk. 1 lecture, 1 laboratory. Prerequisite: DM 232

DM 236 Buttermaking (4)
Equipment and methods needed to handle and process manufacturing cream. Churning, packaging, storing, and marketing butter. Theory of continuous buttermaking. Practice in college creamery. 3 lectures, 1 laboratory. Prerequisite: DH 121, DM 132

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: DH 121, DM 132, Bact 222

DM 332 Dairy Inspection (2)
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. Laws governing pricing and marketing. Role of antibiotics and pesticides in modern dairying. 1 lecture, 1 laboratory. Prerequisite: DH 121, DM 133, Bact 221

DM 333 Advanced Dairy Products Judging (2)
Judging and scoring of milk, butter, cheddar cheese, ice cream and cottage cheese. Commercial scoring with emphasis on the finer points of competitive grading and scoring. 2 laboratories. Prerequisite: DM 233

DM 336 Creamery Records (3)
Production control within the plant, department records, inventories, dairy work sheets, production schedules, load out and route return slips, checking, recapitulation, fat losses and their control, and records on receipts, production and distribution as required by the state. Practical application through use of facilities and records of the college creamery. 2 lectures, 1 laboratory. Prerequisite: DM 132, 133, 232, 236
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: Senior standing.

DM 461, 462  Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

DM 463  Undergraduate Seminar (2)

Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy manufacturing information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 lectures. Prerequisite: DM 461, 462

FARM MANAGEMENT DEPARTMENT

Department Head, Edgar A. Hyer

Gaylord J. Chizek  J. Philip Bromley  John A. Rogalla  C. William Vrooman

The main purpose of this curriculum is to prepare the student to operate and manage a farm or ranch. While the management of a farm should be the primary purpose of most students taking the curriculum, students may also plan to engage in allied work such as farm credit and farm appraisal or in the teaching of agriculture.

A large number of agricultural production courses is provided as a basis for sound management preparation. Business training received in the farm management department is supplemented by instruction from other departments in accounting, statistics, law, and business organization.

Interwoven throughout the curriculum are general education courses in English, mathematics, history, economics, and political science which provide the basis for better citizenship and understanding of society.

CURRICULUM IN FARM MANAGEMENT

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<th>Freshman</th>
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<td>Project Records (FM 100)</td>
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<td>Introduction to Farm Management (FM 104, 105)</td>
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<td>Agricultural Mechanics (AE 121, 122)</td>
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<td>Agricultural Mathematics (Math 102, 103)</td>
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<td>Language Communication (Eng 104, 105)</td>
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* At least 40 units shall be chosen with the approval of the adviser from other fields of agriculture.
Sophomore

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<td>Agricultural Economic Analysis (FM 203)</td>
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<td>Agricultural Marketing (FM 304)</td>
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<td>Agricultural Resources (FM 305)</td>
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<td>Farm Records (FM 321)</td>
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<td>Soils (SS 121)</td>
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<td>Soils Management (SS 122)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Report Writing (Eng 301)</td>
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<td>Basic Accounting (Actg 131, 132)</td>
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<td>Sports Education (PE 241)</td>
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Junior

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<td>Principles of Farm Management (FM 322)</td>
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<td>Types of Farm Operation in California (FM 325)</td>
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<td>Farm Appraisal (FM 326)</td>
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<td>Crops Farm Management Problems (FM 421)</td>
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<td>General Psychology (Psy 202)</td>
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<td>General Business Administration (Bus 306)</td>
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<td>General Inorganic Chemistry (Chem 324, 325)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<td>Descriptive Statistics (Math 211)</td>
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<td>Statistical Methods (Math 212)</td>
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<td>Business Law (Bus 301)</td>
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Senior

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<td>Agricultural Prices and Government Control (FM 403)</td>
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<td>Farm Management Problems (FM 424, or FM 425, or FM 426)</td>
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<td>Large Farm Accounting (FM 431)</td>
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<td>Management Participation on College Farm (FM 460)</td>
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<td>Senior Project (FM 461, 462)</td>
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<td>Undergraduate Seminar (FM 463)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>U.S. in World Affairs (Hist 305)</td>
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<td><strong>Total</strong></td>
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DESCRIPTORS OF COURSES IN FARM MANAGEMENT

**FM 100 Project Records (1)**

Organisation of the foundation, records needed to conduct a project, methods of keeping records, and their analysis. Adapted to student conducting a project under the supervision of the college. 1 lecture.

**FM 101A Introduction to Agricultural Economics (5)**

Modern economic system, history of U.S. Agriculture, agriculture's role in the economy, prices of agricultural products, marketing agricultural products, agricultural credit and finance, agricultural resources and land use, the role of farm management, introduction to farm management analysis processes, agriculture and the

* At least 40 units shall be chosen with the approval of the adviser from other fields of agriculture.
† See General Education list. Include at least one course in literature.
Agriculture Division

government. May not be substituted for Ec 201, 202 or FM 305. 4 lectures, 1 2-hour laboratory. To be taken only by technical students.

FM 101B  Farm Records and Farm Management Practices (4)
Farm recordkeeping for income tax purposes and study of farm business, measures of farm profits, factors affecting farm profits, reorganization of an actual farm. May not be substituted for FM 321 or 322. 3 lectures, 1 2-hour laboratory. To be taken only by technical students. Not open to degree students for degree credit.

FM 101C  Farm Management Problems (5)
Crop and livestock enterprise costing, equipment costing and efficiency, determination of most profitable crop combinations, most profitable application of inputs, labor management, government price programs. May not be substituted for FM 421, 424, 423, or 426. 3 lectures, 2 2-hour laboratories. Prerequisite: FM 101B. To be taken only by technical students.

FM 104, 105  Introduction to Farm Management (1) (1)
Development of American agriculture, need for farm management in agriculture, training necessary for the farm manager. 1 lecture.

FM 124  Agriculture (3)
Identification and use of major crops and livestock, types of farming in the United States, the place and function of the farm marketing system, broad classes of soil and their general management problems, the farm problem as it affects farmers and citizens, identification of plants for the home and their general care. 2 lectures, 1 2-hour laboratory. For nonagriculture majors only.

FM 203  Agricultural Economic Analysis (3)
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. 3 lectures. Prerequisite: Ec 202

FM 300  Successful California Farms (1)
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. Maximum credit is 3 units for three different trips.

FM 304  Agricultural Marketing (3)
Principles of marketing agricultural products, market functions, channels, market institutions, introduction to co-operative marketing, cost of marketing, marketing problems by commodities, marketing policy, government regulation. 3 lectures. Prerequisite: Ec 201

FM 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: Ec 201

FM 310  Farm Credit (3)
Finance principles for farmers, farm credit needs, types of credit, credit sources, requirements, farm finance planning, discussion with credit representatives. 3 lectures. Prerequisite: Actg 131 or FM 321

FM 321  Farm Records (3)
Fundamentals of record keeping, kinds of records, inventory, depreciation, cash and accrued basis, of income tax reporting, balance sheet, operating statement, analysis of statements. 2 lectures, 1 2-hour laboratory. Prerequisite: Ec 201
FM 322 Principles of Farm Management (4)
The role of farm management, types of farming, problems of leasing and buying a farm, labor problems, measures of profits, factors affecting profits, budgeting of laboratory farms, independent analysis of farm for term report. 3 lectures, 1 2-hour laboratory. Prerequisite: FM 321 or Actg 131 and 132

FM 325 Types of Farm Operation in California (3)
Agricultural regions of California considered from standpoint of physical resources, crops and livestock, size, tenure, water problems, relation to urban areas, land development. 2 lectures, 1 2-hour laboratory. Prerequisite: FM 322

FM 326 Farm Appraisal (3)
Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 2 lectures, 1 2-hour laboratory. Prerequisite: FM 322

FM 403 Agricultural Prices and Government Control (3)
Price making process, price variation and trends, reports and forecasting, governmental price control programs, price characteristics and problems of specific agricultural commodities. 3 lectures. Prerequisite: Ec 201

FM 406 Advanced Agricultural Economic Analysis (3)
Basic mathematical concepts; marginal analysis; maximization, minimization and basic differential calculus, linear programming as it pertains to the agricultural firm. 3 lectures. Prerequisite: FM 203, Math 212

FM 421 Crop Farm Management Problems (3)
Crop enterprise costing procedure, analysis of rotation systems, labor problems, irrigation plans, determination of most profitable rates of fertilization and irrigation, marketing crops, land development costs, effect of shifting cropping plan. 3 lectures. Prerequisite: FM 322

FM 424 Poultry Husbandry Farm Management Problems (3)
Poultry enterprise costing procedure, economics of plant layout, analysis of labor saving equipment and procedure, determination of most profitable feed combination, credit for poultrymen, use of outlook reports, marketing methods. 3 lectures. Prerequisite: FM 322

FM 425 Animal Husbandry Farm Management Problems (3)
Costing procedure for animal enterprises, types of beef operations compared, feed lot management problems, determination of most profitable feed rations, livestock marketing procedure, effect of feed resource changes on organization and profits. 3 lectures. Prerequisite: FM 322

FM 426 Dairy Farm Management Problems (3)
Dairy enterprise costing procedure, relation of cropping plan to dairy organization, analysis of feed resource costs, determination of most profitable feed rations, costs and problems of shifting from grade B to grade A dairy, most profitable culling. 3 lectures. Prerequisite: FM 322

FM 430 Orientation to California Agriculture (6)
Study of California agriculture through visitation to major production areas of the State. Problems in connection with organization, management, production practices, marketing procedures, use of equipment, soils, climate, and irrigation are considered. Offered in summer only. Open only to agricultural majors. Prerequisite: Senior standing or permission of Dean of Agriculture.

FM 431 Large Farm Accounting (3)
Application of commercial accounting process to large farm accounting problems. Special emphasis will be given to the problem of devising and executing an accounting system that will give necessary details on specific enterprises for analysis and control. 2 lectures, 1 2-hour laboratory. Prerequisite: Actg 131, 132
FM 460  Management Participation on College Farm (1)
Limited management of college agricultural resources. Analysis of particular management problems on the college farm. Total credit limited to 3 units. 1 lecture. Prerequisite: Senior standing.

FM 461, 462  Senior Project (2) (2)
Analysis of a farm management problem selected by student with approval of adviser. Project results are presented in a formal report. Minimum 120 hours total time.

FM 463  Undergraduate Seminar (2)
Student presentation and description of developments and problems in farm management. 2 lectures.

FM 581  Graduate Seminar in Farm Management (3)
Group study of current problems; development and analysis methods in the field. Consideration given to the place of Farm Management in the teaching of vocational agriculture. 3 lectures.
The Food Processing curriculum is designed to prepare students for employment in the various phases of the food processing and related industries. Instruction in the field qualifies students for careers in production, management and marketing operations of the industry. This curriculum does not prepare students for the specialized field of food technology and research.

The curriculum provides applied knowledge of the technology of the industry that will enable the graduate to accomplish doing and management jobs connected with operations of the industry from field to market. Skills acquired in the production aspects of the processing business 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.

**CURRICULAR OPTIONS**

**Management**

The Management Option emphasizes preparation for participation in production and management aspects of the industry.

**Operations**

The Operations Option emphasizes applied and theoretical knowledge of processing plant operations with related courses in equipment and engineering.

**Meats**

The Meats Option provides experience in meat packing and processing operations correlated with related science and business aspects of the industry.

**CURRICULUM IN FOOD PROCESSING**

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<tr>
<td>Survey of Food Industry (FI 101)</td>
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<td>Food Processing Machinery (FI 122)</td>
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<td>Elements of Food Processing (FI 123)</td>
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<td>Language Communication (Eng 104, 105)</td>
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<tr>
<td>Introduction to Literature (Eng 207)</td>
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<td>Mathematics for Business (Math 108, 109)</td>
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<td>Introductory Physics (Phys 104)</td>
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<td>Agricultural Mechanics (AE 121 or AE 128)</td>
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**Agriculture Division**

### Sophomore

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<td>Food Processing Operations (FI 221, 222, 223)</td>
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<td>Sanitation and Waste Disposal (FI 232)</td>
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<td>Processed Food Inspection (FI 233)</td>
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<td>Investment Mathematics (Math 207)</td>
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<td>Boilers and Steam Equipment in Agriculture (AC 237)</td>
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<td>Refrigeration in Agriculture (AC 238, 239)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Physical Education (PE 241)</td>
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**MANAGEMENT OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)**

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<td>ABM 103 Ag Business Organization</td>
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<td>ABM 203 Ag Business Credit and Finance</td>
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<td>MSM 204 Marketing Principles</td>
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<td>DM 230 General Dairy Manufacturing</td>
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<tr>
<td>AE 323 Ag Products Handling</td>
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<td>Actg 223 Cost Accounting and Analysis</td>
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<tr>
<td>ABM 322 Advanced Ag Business Management</td>
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### Sophomore

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<tr>
<td>FI 421 Advanced Food Processing</td>
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*To be selected from the General Education list.*
### OPERATIONS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

**Freshman**
- FP 230 California Fruit Growing (4)
- VC 230 General Vegetable Crops (4)
- ME 151-2-3 Engineering Drafting (3)
- or
  - AE 133 Farm Drafting (2)
  - Weld 141-2 Shop Processes (2)
  - MS 151-2 Machine Shop (2)

**Sophomore**
- Phys 121-2-3 College Physics (12)
- DM 230 General Dairy Manufacturing (4)
- AE 323 Ag Products Handling (3)
- AE 324 Rural Electrification (3)
- IR 311 Industrial Management (3)
- FL 421 Advanced Food Processing (4)

**Junior**
- Zoo 131-2 General Zoology (8)
- VS 123 Anatomy & Physiology (3)
- FL 212 Meat Classification and Grading (2)

**Senior**
- FL 338 Sausage, Smoked and Canned Meats (3)
- IR 311 Industrial Management (3)
- FL 431 Meat Technology (4)
- VS 310 Zoonosis (2)

### MEATS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

**Freshman**
- AH 121 Market Beef Production (4)
- AH 122 Elements of Swine Production (4)
- FL 210 Meats (3)

**Sophomore**
- Zoo 131-2 General Zoology (8)
- VS 123 Anatomy & Physiology (3)
- FL 212 Meat Classification and Grading (2)

**Junior**
- FL 138 Sausage, Smoked and Canned Meats (3)
- IR 311 Industrial Management (3)
- FL 431 Meat Technology (4)
- VS 310 Zoonosis (2)

### DESCRIPTIONS OF COURSES IN FOOD PROCESSING

**FL 101 Survey of Food Industry (2)**
- Introductory course including size, distribution, major production areas of the food processing industry. 2 lectures.

**FL 122 Food Processing Machinery (3)**
- Processing equipment selection, use, maintenance and repair. 2 lectures, 1 laboratory.

**FL 123 Elements of Food Processing (3)**
- Principles of unit processes in food processing including canning, freezing, concentration, dehydration and fermentation. 2 lectures, 1 laboratory.

**FL 209 Meats (3)**
- Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, and nutritional value. 2 lectures, 1 laboratory.

**FL 210 Meats (3)**
- Practice in slaughtering and processing of beef cattle, sheep and hogs. A study of carcass grades, yield, and cut out value. Meat curing methods, by-products and consumption trends. 2 lectures, 1 laboratory.

**FL 212 Meat Classification and Grading (2)**
- A comprehensive and detailed study of those factors related to carcass quality, conformation, and finish, to include meat classification, grading and judging of carcass and wholesale cuts of beef, pork, and lamb. Field trip to meat packing plants is required. 1 lecture, 1 laboratory. Prerequisite: FL 210

* Phys 121 to be substituted for Phys 104.
Agriculture Division

Fl 221, 222, 223, 224 Food Processing Operations (3) (3) (3) (3)
Lecture and laboratory study of complete processing procedures for seasonal fruits and vegetables, specialties and other processed food. 2 lectures, 1 laboratory. Fl 224 offered in summer only.

Fl 230 Elements of Food Processing (4)
Principles of unit operations in food processing covering canning, freezing, dehydration, concentration and fermentation. For majors other than Food Processing majors. 3 lectures, 1 laboratory.

Fl 232 Sanitation and Waste Disposal (2)
The organization, management and operation of a food plant sanitation and waste disposal program. 1 lecture, 1 laboratory.

Fl 233 Processed Food Inspection (3)
Fundamentals, principles and procedures for inspecting processed foods based upon federal and state grades. Laboratory work in grading various products. 2 lectures, 1 laboratory.

Fl 321 Food Plant Quality Control (3)
Methods of organizing and operating field and plant quality control systems including methods of and typical applications of statistical quality control. 2 lectures, 1 laboratory. Prerequisite: Fl 221

Fl 332 Statistical Quality Control (3)
The application of statistical methods in quality control programs and evaluation of operations. 2 lectures, 1 laboratory. Prerequisite: Fl 221, 222, or 223

Fl 333 Food Production Control (4)
Plant equipment construction, plant layout and flow lines, cost estimating, work simplification, automation and control systems. 3 lectures, 1 laboratory. Prerequisite: Junior standing and instructor's permission.

Fl 338 Sausage, Smoked and Canned Meats (3)
The manufacturing of processed meats. Product formulation, curing, smoke house operation, meat canning, sanitation and quality control. 2 lectures, 1 laboratory. Prerequisite: Fl 209, 210 or 212

Fl 421 Advanced Food Processing (4)
Detailed study of more involved food processing operations with problems of physical and chemical actions of the processes. Includes triple effect and high vacuum concentration, freeze drying, aseptic canning and similar processes. Also latest equipment developments. Prerequisite: Fl 222, Math 118, Phys 123, Chem 326

Fl 431 Meat Technology (3)
Characteristics of meat and meat products as related to processing and marketing with special emphasis on problems and variations encountered during these operations. 2 lectures, 1 laboratory. Prerequisite: Fl 209, 210, or 230. Chem 326 or equivalent.

Fl 432 Packaging (3)
Study of packaging materials, packages and packaging methods applicable to a variety of processed foods. 2 lectures, 1 laboratory.

Fl 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

Fl 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 his chosen field. 2 lectures.

Fl 581 Graduate Seminar in Food Processing (3)
Current findings and research problems in the field and their application to the industry. 3 lectures.
The objective of this department is to prepare students for employment in the nursery, landscape and florist industries. This includes both the production and sales and service areas of these major fields. The training stresses production of nursery plants, flower production, the design and management of nurseries and greenhouses, landscape design, landscape planting, and landscape supervision.

Graduates of the Ornamental Horticulture Department qualify for managerial positions in nursery 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, greenhouse management, landscape design, and field advising for fertilizer and insecticide companies.

The facilities of the department include a student-operated commercial nursery in which students carry on a project program involving wholesale and retail sales, 8,000 square feet of glasshouses, 3,000 square feet of lathhouses, a clothhouse, coldframes, and extensive field growing areas. Large, modern, well-equipped laboratories adjoin the greenhouse range. The entire 100 acres of landscaped campus area serves as an outdoor laboratory. The campus is planted with many interesting and unusual trees and shrubs from all over the world. The campus also contains a large number of native California trees and shrubs.

Equipment includes the latest models of power equipment necessary in nurseries, greenhouses, parks and grounds, and landscaping. An extensive list of periodicals covering the field of ornamental horticulture is subscribed to and available to students. Through the staff, affiliation in several national horticultural organizations is maintained.

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

**CURRICULUM IN ORNAMENTAL HORTICULTURE**

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<th>Freshman</th>
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<td>Nursery Practice (OH 121)</td>
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<td>Floriculture (OH 123)</td>
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## Agriculture Division

### Sophomore

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<td>Suburban Home Planning (OH 223)</td>
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<td>Plant Propagation (OH 233)</td>
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<td>Herbaceous Plants (OH 226)</td>
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<td>Soils (SS 121)</td>
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<td>Native Plant Materials (Bot 238)</td>
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<td>Arboriculture (OH 421)</td>
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<td>Senior Project (OH 461, 462)</td>
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<td>§§ Literature, Philosophy</td>
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<td>Fruit Crops (FP 230, 322, or 332)</td>
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### Descriptions of Courses in Ornamental Horticulture

**OH 100 Orientation to Ornamental Horticulture (1)**

Ornamental Horticulture as a career. Preview of the nursery, florist, and landscape industries. Discussion of student projects and project records. 1 lecture.

**OH 121 Nursery Practices (4)**

Commercial nursery operations. Propagation, nursery layout, seed sowing, transplanting, potting, canning, fertilizing, irrigation, and pest control. Bedding plants, greenhouse plants, trees, and shrubs. 3 lectures, 1 laboratory.

* At least 12 units to be selected with the approval of the adviser.
** To be selected from any 300-400 series course in ABM or FM.
§ Plant physiology (Bot 322) may substitute for this requirement.
§§ See General Education list. Include at least one course in Literature.
OH 122 Ornamental Shrubs (4)
Shrubs and vines used in California. Identification, habits of growth, cultural requirements, and landscape use. 3 lectures, 1 laboratory.

OH 123 Floriculture (4)
The operating of greenhouses and other forcing structures. A study of the relationship of light, heat, temperature, and moisture to plant growth. 3 lectures, 1 laboratory. Prerequisite: OH 121

OH 124 Landscape Drafting (2)
Drafting techniques and standards progressing from tracings to light construction working drawings. 1 lecture, 1 laboratory.

OH 125 Flower Arrangement (4)
A study of the principles of flower arrangement and corsage making. 2 lectures, 2 laboratories.

OH 220 Home Landscaping (3)
Landscape design of urban and rural homes. Garden maintenance problems of landscaped properties. For non-horticulture majors. 2 lectures, 1 laboratory.

OH 221 Ornamental Trees (4)
Broadleaf trees grown and used in California. Identification, habits of growth, cultural requirements, and landscape use. 3 lectures, 1 laboratory.

OH 223 Suburban Home Planning (4)
Principles of landscape design for residential properties. Designing of several small home properties. 2 lectures, 2 laboratories. Prerequisite: OH 122, 124, 221

OH 225 Flower Judging (3)
Procedure and practice in score card grading of cut flower and pot plant classes. Commercial grades will be used as well as specimens generally grown by the amateur gardener. 1 lecture, 2 laboratories. Prerequisite: OH 121

OH 226 Herbaceous Landscape Plants (4)
The identification, habits of growth, and landscaping uses of ornamental annuals and herbaceous perennials commonly grown for California landscaping. 3 lectures, 1 laboratory. Prerequisite: OH 121, 122

OH 227 Flower Shop Management (4)
Practices and problems in the management of the retail flower shop with emphasis upon shop layout, window display, telegraph delivery services, buying, selling, and personnel relations. 2 lectures, 2 laboratories. Prerequisite: OH 125

OH 228 Advanced Flower Arrangement (4)
Advanced styling of floral designs including: wedding flowers, funeral designs, advanced corsages, hospital arrangements and baskets for all occasions. 2 lectures, 2 laboratories. Prerequisite: OH 125

OH 230 Ornamental Gardening (3)
For non-horticulture majors. A general course in ornamental horticulture with emphasis upon plant production. Includes budding, potting, seed sowing, transplanting, pest control, and the planting of lawns, trees, shrubs, and flower beds. 2 lectures, 1 laboratory.

OH 233 Plant Propagation (4)
Principles of asexual propagation. Budding, cutting, layering, division, and separation. 3 lectures, 1 laboratory. Prerequisite: OH 121, 123

OH 322 Landscape Design (4)
Principles of landscape design of public properties and the application of these principles in solving of landscape design problems. 2 lectures, 2 laboratories. Prerequisite: OH 122, 124, 221, 223
Agriculture Division 111

OH 323 Greenhouse Management (4)
The production of major commercial potted plants under glass and lath. Preparation for sale and merchandising of greenhouse crops. 3 lectures, 1 laboratory. Prerequisite: OH 121, 123, 334, SS 121, 221

OH 327 Diseases and Pests of Ornamental Plants (3)
A detailed study of diseases and pests of ornamental plants, their effect on plants, their prevention and control. 2 lectures, 1 laboratory. Prerequisite: OH 122, Ent 126, Bot 223

OH 331, 332 Landscape Contracting (4) (4)
Practices in supervising men and applying approved techniques in landscape construction. Cost finding and estimating for landscape trades. Contract writing, accounting systems, and legal aspects of landscape contracting. 3 lectures, 1 laboratory. Prerequisite: OH 124

OH 333 Turf Maintenance and Management (4)
Practice in the maintenance and management of turf areas, including golf greens, athletic fields and park lawns. 3 lectures, 1 laboratory. Prerequisite: OH 121, 337, and junior standing in the college.

OH 334 Cut Flower Production (4)
The production of cut flowers in the field, under cloth, and under glass. Preparation of cut flowers for market. 3 lectures, 1 laboratory. Prerequisite: OH 121, 123, SS 121, 221

OH 337 Landscape Management (4)
The preparation and planting of lawns and flower beds. Planting and care of shrubs. Maintenance of established plantings. 3 lectures, 1 laboratory. Prerequisite: AE 122, OH 122, 221

OH 338 Advanced Plant Propagation (4)
Advanced nursery and plant propagation practices. Grafting, dormant budding, lining out, balling out, bare rooting, and making hardwood cuttings. Construction and operation of forcing structures. 3 lectures, 1 laboratory. Prerequisite: OH 121, 233

OH 400 Special Problems for Advanced Undergraduates (1-2)
Individual study involving horticultural writing, design and construction of new equipment, and minor investigations into plant growth. Total credit limited to 4 units. Prerequisite: Permission of the department head.

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 221, 337

OH 430 Landscape Plants (2)
The identification and landscape use of trees, shrubs and herbaceous plant materials. For non-ornamental horticulture majors. 1 lecture, 1 laboratory.

OH 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

OH 463 Undergraduate Seminar (2)
An open forum of senior students in which the latest developments, practices, and procedures are discussed. Each student is responsible for the development and presentation of a topic in his chosen field. 2 lectures.

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.
The poultry industry is an important part of agriculture and food production in California. This industry offers an increasing demand for young men trained in modern techniques of the industry. The function of this department is to prepare students for various major fields of commercial poultry production and the many allied services of the industry. Opportunities in the allied industry services are many as shown by the fact that graduates have worked in more than fifty kinds of jobs within the industry.

In addition to typical ranch production opportunities for employment, graduates may find many openings in marketing organizations, processing plants, feed and supply services, hatcheries, governmental agencies or agricultural teaching.

The college plant has facilities for more than 6,000 birds in the 12-acre poultry plant which maintains a commercially productive unit with six breeds of chickens, in addition to the turkey flock. The plant includes a modern 15,000 egg hatchery, poultry-dressing plant, and egg-handling facilities as well as most of the types of poultry-raising equipment commonly used in California.

Each poultry major has an opportunity to conduct commercially productive projects in market eggs, hatching eggs or meat birds which gives him additional experiences in the field of his major interest and practice in many business transactions. Advanced students may have opportunities to conduct technical management or developmental problems.

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

### CURRICULUM IN POULTRY INDUSTRY

<table>
<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>Poultry Industry Development (PI 121)</td>
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<tr>
<td>Replacement Programs &amp; Broiler Production (PI 122)</td>
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<tr>
<td>Poultry Feeding &amp; Nutrition (PI 123)</td>
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<tr>
<td>Agricultural Mechanics (AE 121, 122)</td>
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<tr>
<td>Feeds and Feeding (AH 101)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Agricultural Mathematics (Math 102, 103)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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<tr>
<td>General Zoology (Zoo 131, 132)</td>
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<tr>
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<tr>
<td>Electives</td>
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<tr>
<td></td>
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</tbody>
</table>
Sophomore

Poultry Selection and Egg Production (PI 221) ........................................ 2
Poultry Production Processing & Marketing (PI 222) .................................. 3
Poultry Incubation (PI 223) ........................................................................ 2
Poultry Plant Design & Equipment (PI 233) ............................................... 2

Agricultural Engineering

Poultry Anatomy and Physiology (PI 231) ..................................................... 3
Soils (SS 121) .......................................................................................... 2
Public Speaking (Sp 201) ........................................................................... 2
Principles of Economics (Ec 201) ............................................................... 3

Social Sciences Elective

Sports Education (PE 241) ........................................................................... 3
General Bacteriology (Bact 221) ................................................................. 4
Genetics (Bio 303) ..................................................................................... 3
General Psychology (Psy 202) ................................................................. 3

Business Management

Electives ...................................................................................................... 2

Junior

Applied Poultry Breeding (PI 321) ............................................................ 3
Hatchery Business Organization (PI 322) ............................................... 4
Poultry Hygiene and Flock Health (PI 303) ............................................ 3

Agricultural Engineering

Farm Records (FM 321) .............................................................................. 3
Principles of Farm Management (FM 322) ............................................. 4

Literature, Philosophy

American Government (Pol Sc 301) ....................................................... 3
Growth of American Democracy (Hist 304) ....................................... 3
General Inorganic Chemistry (Chem 324, 325) ...................................... 4
Organic Chemistry (Chem 326) ............................................................. 4

Electives ..................................................................................................... 3

Senior

Advanced Poultry Enterprise Supervision (PI 402) .................................... 3
Turkey Industry (PI 421) .......................................................................... 3
Senior Project (PI 461, 462) .................................................................... 2
Undergraduate Seminar (PI 463) ........................................................... 2
Animal Nutrition (AH 402) ...................................................................... 4

Management Elective .................................................................................. 3

U. S. in World Affairs (Hist 305) .............................................................. 3
Agricultural Biochemistry (Chem 328) .................................................. 4

Electives .................................................................................................... 11

Senior Project (PI 461, 462) .................................................................... 2
Undergraduate Seminar (PI 463) ........................................................... 2
Animal Nutrition (AH 402) ...................................................................... 4

Management Elective .................................................................................. 3

U. S. in World Affairs (Hist 305) .............................................................. 3
Agricultural Biochemistry (Chem 328) .................................................. 4

Electives .................................................................................................... 11

Descriptions of Courses in Poultry Industry

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.

See General Education list. Include at least one course in literature.
† To be selected from the General Education list.
‡ To be selected from any 300-400 series course in ABM or FM.
§ To be selected from AE 131, 133, 134, 141, 231.
** To be selected from Bus 301, 310, IR 118, 311, 312.
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: AH 101

PI 221 Poultry Selection and Egg Production (2)
Biological environmental factors that affect quality, size, and number of eggs produced. Techniques and practices of working with the commercial producing flock. 1 lecture, 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 (3)
Structural aspects and normal functions of the principal systems of domestic poultry. 2 lectures, 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 248 Hatchery Operation (1)
Hatchery practice in care and operation of incubators. Servicing and adjusting the equipment and controlling sanitation. Skills in grading chicks, pedigree banding, and keeping hatchery records. 1 laboratory.

PI 303 Poultry Hygiene and Flock Health (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 231

PI 320 Poultry Consumer Education (2)

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. 2 lectures, 1 laboratory.

PI 322 Hatchery 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 the hatchery organization. 3 lectures, 1 laboratory. Prerequisite: PI 321
Agriculture Division

PI 402 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: All required freshman and sophomore poultry courses and PI 321

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: PI 123, 231, 321

PI 461, 462 Senior Project (2) (2)
 Selection and completion of a project under a minimum of 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 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.
The objectives of this department are to prepare students for employment in the fields of Soil Science and to provide instruction in soil science courses for students in other departments of the College.

Courses in soil science have been developed with lecture, laboratory, and field coverage to provide fundamental knowledge of the subject and its application in agricultural production.

Completion of the four-year curriculum entitles the graduate to a bachelor of science degree in soil science. This curriculum has been designed to prepare individuals for employment in positions that require a wide knowledge of agriculture, such as vocational agricultural teachers, soil conservationists, land appraisers, fertilizer distributors, farm advisers, farm managers, or farm operators; and, highly specialized positions, such as that of soil surveyors, laboratory technicians, college instructors, and soil specialists.

Facilities of the department have been developed to provide laboratory and field house space and equipment to meet the needs of the program. Demonstration plots and the application of soil management practices on the college farm are utilized to the fullest possible extent in the study of methods for putting soil knowledge to work. Practices of outstanding value on nearby ranches and those being carried on by public agencies are also widely utilized.

Students interested in the two-year technical certificate should refer to the introductory statement for the Agriculture Division which describes his program. Detailed curriculum information is available from the department head.

**CURRICULUM IN SOIL SCIENCE**

<table>
<thead>
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<th>Freshman</th>
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<tr>
<td>Soils (SS 121)</td>
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<td>Soil Management (SS 122)</td>
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<td>Soil Materials (SS 123)</td>
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<td>Crop Production (CP 121 or 122 or 230 or VC 230)</td>
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<td>Animal Production (AH 230 or DH 230 or PI 230)</td>
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## Agriculture Division

### Sophomore

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<tr>
<td>Soil Conservation (SS 202)</td>
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<tr>
<td>Fertilizers (SS 221)</td>
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<tr>
<td>Range Management (AH 229)</td>
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<tr>
<td>Fruit Production (FP 131 or 132 or 230)</td>
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<tr>
<td>Nursery Practices (OH 220 or 230)</td>
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<td>Agricultural Surveying (AE 131)</td>
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<td>Mathematics (Math 100, 200 or 117 or 118)</td>
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<td>General Inorganic Chemistry (Chem 324, 325)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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### Junior

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<tr>
<td>Soil Classification (SS 321)</td>
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<tr>
<td>Soil Fertility (SS 322)</td>
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<tr>
<td>Land Use Planning (SS 433)</td>
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<tr>
<td>Farm Records (FM 321) or Basic Accounting (Actg 131)</td>
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<tr>
<td>Farm Management (FM 322)</td>
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<tr>
<td>Agricultural Biochemistry (Chem 328)</td>
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<tr>
<td>General Bacteriology (Bact 221)</td>
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<tr>
<td>General Entomology (Ent 126)</td>
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<tr>
<td>U. S. in World Affairs (Hist 305)</td>
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<tr>
<td>Public Speaking (Sp 201)</td>
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<td>Introduction to Literature (Eng 207)</td>
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### Senior

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<tbody>
<tr>
<td>Soil Microbiology (SS 422)</td>
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<td>Soil Chemistry (SS 423)</td>
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<tr>
<td>Soil Physics (SS 432)</td>
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<tr>
<td>Senior Project (SS 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (SS 463)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>Introduction to Philosophy (Phil 201)</td>
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<tr>
<td>*Literature</td>
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<td><strong>Management Elective</strong></td>
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<tr>
<td>*Electives</td>
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<td><strong>Total</strong></td>
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### Descriptions of Courses in Soil Science

#### 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

* Of the total elective units a minimum of 16 shall be chosen with the approval of the adviser.
** To be selected from any 300-400 series course in ABM or FM.
† To be selected from the General Education list.
‡ To be selected from the General Education list.
SS 123 Soil Materials (3)
Origin, composition, and identification of rocks, minerals, and other materials important in the development of soils. Land forms as related to the nature and properties of soils. 2 lectures, 1 laboratory. Prerequisite: SS 122

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

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 230 General Soils (3)
Soil properties and common soil management, fertility, and conservation practices. A general course for other than soils majors. 2 lectures, 1 laboratory.

SS 321 Soil Classification (4)
Systems used in soil and land classification. Methods employed in soil surveying. Mapping of assigned areas and the preparation of survey reports. 3 lectures, 1 laboratory. Prerequisite: Completion of 18 units in Soils Science courses.

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: Completion of 18 units in Soils Science courses.

SS 422 Soil Microbiology (4)
Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 3 lectures, 1 laboratory. Prerequisite: Senior standing in Soil Science

SS 423 Soil Chemistry (3)
Fundamental concepts and practices in soil chemistry. Methods of analysis and interpretation of significant investigations for the management of soils. 2 lectures, 1 laboratory. Prerequisite: Senior standing in Soil Science

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: Senior standing in Soil Science

SS 433 Land Use Planning (3)
Evaluation of land use capabilities. Development of plans and practices for the management of crop, range, and forest land. 2 lectures, 1 laboratory. Prerequisite: Senior standing in Soil Science

SS 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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 students' major field of interest. Preparation and presentation of reports on problems or research activities. 2 lectures.

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.
Veterinary science courses are offered to supplement the major work provided in the animal science departments of the Agricultural Division. Keeping the college herds and flocks healthy provides the student with valuable laboratory opportunities in basic veterinary hygiene. Veterinary science courses are open as elective courses to students who have the proper prerequisites.

The department also supplies meat inspection service for the meats laboratory.

DESCRIPTIONS OF COURSES IN VETERINARY SCIENCE

VS 100  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, 202 and 203. Not open to degree students for degree credit.

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, 132

VS 202  Livestock Hygiene and Sanitation (3)
Animal health problems encountered on the farm. The livestock producer's part in disease control and animal health improvement programs. 3 lectures. Prerequisite: Bact 221

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, 132

VS 310  Zoonosis (2)
A study of some of the common diseases of domestic animals and birds which can be transmitted to man. 2 lectures. Prerequisite: Zoo 131, Bact 221
THE ENGINEERING DIVISION
Strength of Materials Laboratory, Mechanical Engineering

Preparing to Run Test in Aero Stress Analysis Laboratory

Pneumatic Application of Concrete in Architectural Experimental Yard
A DEFINITION

Engineering consists of understanding real situations related to technical systems and components, analyzing and synthesizing them, and applying usable solutions to the real situations.

Faced with a real situation, the engineer first appraises it and understands it. He may have to make a series of measurements and do extensive reading and consultation before he has all of the necessary facts at hand essential to the understanding. He then proceeds with his analysis and synthesis relying on knowledge gained by education and experience. He thus develops a usable solution and applies it to the real situation. He does this consistently and for a variety of problems.

The principal concept in engineering is the constant interplay between theory and application.

The word engineering covers a broad spectrum of activity ranging from fundamental research to semi-routine operations. Each of the areas in the spectrum demands particular disciplines and aptitudes characteristic of that area. On the one extreme, it is difficult to distinguish the engineer from the research scientist. On the other extreme, the engineer has certain things in common with the highly skilled technician. Between the two extremes there is a broad middle region in which the engineer can readily be identified as such. In this region of the spectrum, the engineer works in design, manufacturing, and marketing. He deals with physical systems and components. He relies on a combination of theory, judgment, and experience to solve problems in design and application.

THE CAL POLY PROGRAM

The engineering program at Cal Poly is designed to match the above definition, and to serve the middle region of the engineering spectrum. The framework of the program may be expressed graphically:

The fundamental framework is the same although the details vary for the different engineering majors.

1. All freshmen have required courses in the shop and laboratory where they learn to use tools, instruments, and machines characteristic of their major. Initial emphasis is on skills, techniques, and descriptive material which provide background for more advanced courses.

2. The student begins his chosen curriculum course work early in his freshman year. Emphasis on the selected curriculum continues throughout the entire four-year program together with the related work in mathematics, science, and general education.

3. Fundamentals and basic principles are taught in terms of typical problems encountered in industry.

4. Students learn to cope professionally with current engineering problems and are prepared to learn to cope with the problems of the future.

Students completing the full four-year program are awarded the degree of Bachelor of Science in Engineering. The College Placement Office, in close cooperation with all departments, assists the graduate in finding suitable and appropriate employment.
AERONAUTICAL ENGINEERING DEPARTMENT

Department Head, Charles P. Davis

Alfred E. Andreoli  Louis C. Miller  Clifford J. Price
Lester W. Gustafson  Leo F. Philbin  Allen M. Zollars

The Aeronautical Engineering curriculum prepares students for engineering work dealing with the structure, propulsion, control, 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.

The program of the Aeronautical Engineering Department 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 of the Aeronautical Engineering Department obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, and field engineering.

The department has laboratories for fabrication, propulsion, structural test, and aerodynamics, and also has two design rooms and a hangar with adjoining airstrip.

The department sponsors a student chapter of the national society—the Institute of Aeronautics and Astronautics.

CURRICULUM IN AERONAUTICAL ENGINEERING

<table>
<thead>
<tr>
<th>Freshman</th>
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<tbody>
<tr>
<td>Power Plants (Aero 124)</td>
<td>3</td>
<td></td>
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<tr>
<td>Materials and Fabrication (Aero 125)</td>
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* Senior Aero electives:
  6 units to be selected from the following sequences:
  Aero 412, 413; Aero 457, 458; Aero 403, 408; Aero 409, 411; Aero 409, 416.

** Industrial Relations (IR 312) may be substituted.
† To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN AERONAUTICAL ENGINEERING

Aero 124 Power Plants (3)

Aero 125 Materials and Fabrication (3)
Chemical and physical characteristics of materials used in aircraft and missile construction. Identification of materials and nomenclature of parts. Basic manufacturing processes used in the performance of standard tests to determine the behavior under load of materials and fabricated sections. 2 lectures, 1 laboratory.

Aero 126 Aeronautical Laboratory (3)
Introduction to the graphical and analytical solution of aeronautical engineering problems. Tabulation of engineering data, slide rule computations. Methods and procedures used in testing aircraft and missile components. Familiarization with various types of instruments used for testing purposes. The student writes formal engineering reports on his laboratory work. 1 lecture, 2 laboratories. Concurrent: Math 117

Aero 203 Fluid Mechanics of Flight (3)
The properties and characteristics of fluids. Fluid statics and dynamics. Energy flow. Dimensional analysis. Laminar and turbulent flow in systems. 3 lectures. Prerequisite: Math 201, Phys 131

Aero 205 Strength of Materials (3)
Tensile, compressive, and shear stresses in components and structures. Stress-strain relation. Centric, torsional, and flexural loadings. Relationship of shear, moment, slope, and deflection. Bending stresses in simple beams. Thermal stresses. 3 lectures. Prerequisite: Phys 201

Aero 229 Strength of Materials Laboratory (1)

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 250 Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201

Aero 252 Engineering Problems—Analog Computers (1)
Solution of selected engineering problems by means of analog computers. 1 laboratory. Prerequisite: Math 201

Aero 253 Fluid Mechanics Laboratory (1)
The study of the flow of fluids in systems and elementary wind tunnel testing at subsonic speeds. 1 laboratory. Concurrent: Aero 203
Aero 301  Gas Thermodynamics (3)
Fundamental thermodynamic relationships among gas pressure, temperature, specific volume, enthalpy and entropy. Cycle applications to aircraft and missile propulsive units. 3 lectures. Prerequisite: Aero 203, Phys 132

Aero 302  Gas Dynamics (3)
Properties of subsonic, transonic and supersonic flow characteristics of normal and oblique shock waves, expansion waves. Pressure on surfaces in a supersonic airstream by approximate and exact methods. 3 lectures. Prerequisite: Aero 301

Aero 303  Aerodynamics (3)
The atmosphere, airspeed determinations, types of fluid flow, fluid friction, airfoil theory, wing theory, induced drag, parasite drag, power, propeller theory. 3 lectures. Prerequisite: Aero 302

Aero 322  Analog Computer Techniques (3)
The solution of typical problems and dynamics that an aeronautical engineer might encounter by use of analog computer techniques. 1 lecture, 2 laboratories. Prerequisite: Aero 252

Aero 324, 325  Stress Analysis (4) (4)
Analysis of airplane and missile structural components; combined stress and failure theories; column and sheet-stringer panel analysis. Shear-resistant and tension-field beams; single and multi-cell box beams; unsymmetrical and tapered beams. Bulkhead and cutout analysis; analysis of indeterminate structures. Laboratory tests of typical aircraft structural components. Experimental methods of stress analysis. 3 lectures, 1 laboratory. Prerequisite: Math 203, Aero 206

Aero 344, 345  Detail Design (2) (2)
Detail and assembly drawings of aircraft and missile components in accordance with standards and practices of the aerospace industry. Design practice in sheet metal, forging, casting and machining problems. Elementary strength calculations and use of industry manuals, handbooks, and material specifications. 2 laboratories. Prerequisite: ME 142, Aero 206

Aero 346  Aircraft and Missile Performance Laboratory (3)
The determination of the performance characteristics of aircraft and missiles by analytical and graphical methods. 3 laboratories. Prerequisite: Aero 302. Concurrent: Aero 303

Aero 400  Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation. Total credit limited to four units, with not more than two units in any one quarter. 1 or 2 laboratories.

Aero 401, 402  Aircraft and Missile Propulsion Systems (3) (3)
Flightcraft power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turbo jet, ramjet, and rocket engines. 3 lectures. Prerequisite: Aero 302

Aero 403  Rocket Propulsion (3)

Aero 404  Supersonic Aerodynamics (3)
Two-dimensional analysis of supersonic flow, flow in a duct, normal shocks, Prandtl-Meyer expansion and oblique shock. Thin airfoils, transonic conditions. Supersonic wind tunnels, test methods. 3 lectures. Prerequisite: Aero 303
Aero 408 Advanced Flightcraft Structural Analysis (3)
Indeterminate structures, frame analysis, treatment of plates and shells, shear lag and deformation, effect of skin cutouts, application of structural theory to the design of flightcraft components. 3 lectures. Prerequisite: Aero 325

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. Evaluation of hydraulic, electrical, communication, control, and air conditioning systems. Compliance with specifications. Severe environmental operation. 3 lectures. Prerequisite: Aero 402, 415

Aero 410 Mechanical Vibration in Flightcraft (4)
Kinematics of harmonic motion, harmonic analysis, the linear single degree of freedom system, dynamic balancing, critical speed of shafts, seismic instruments, two degrees of freedom systems, dynamic vibration absorbers, self-excited vibrations, including an introduction to flutter theory. 3 lectures, 1 laboratory. Prerequisite: Math 316

Aero 411 Rotary Wing Aircraft (3)
Introduction to the analysis of rotating wing aircraft. Hovering, vertical and translational flights. Types of flight control mechanisms. Performance, stability and control of the complete aircraft. 3 lectures. Prerequisite: Aero 303

Aero 412 Space Technology (3)

Aero 413 Space Technology (3)

Aero 415 Aerodynamics of Stability and Control (3)
Longitudinal stability and control. Static and dynamic stability, wing moments and balance. Factors influencing the stability of the complete airplane. Lateral and directional stability. Design and operation of control surfaces. Compressibility effects. 3 lectures. Prerequisite: Aero 404

Aero 416 Aerodynamics of Performance (3)
Performance analysis of propeller driven and jet powered aircraft. Drag buildup from theory and experimental data. Variation in performance with change of aircraft configuration and propulsive units. 3 lectures. Prerequisite: Aero 404

Aero 444, 445, 446 Missile and Aircraft Design Laboratory (3) (2) (2)
Preliminary layout of a typical transport aircraft and a space vehicle using the design and calculation techniques developed in Aero 346. Design of selected component structures and the preparation of the necessary drawings. 3 or 2 laboratories. Prerequisite: Aero 346

Aero 457, 458 Aeronautical Engineering Laboratory (3) (3)
Use of laboratory instruments to develop the technique of obtaining engineering measurements, special assigned problems in the field of aeronautics. 1 lecture, 2 laboratories. Prerequisite: Aero 303

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)
Individual preparation, oral presentation, and group discussion of subjects of professional and/or technical scope. 2 lectures. Prerequisite: Senior standing.
Theodore G. Graves  William J. Phaklides  Rodney G. Keif  Norman Sharpe

The Air Conditioning and Refrigeration Engineering curriculum prepares students for those phases of engineering characteristic of the broad air conditioning industry. These phases deal particularly with thermal systems and their control in a variety of applications ranging from cold storage plants and modern buildings to hypersonic aircraft and missiles.

The program of the Air Conditioning and Refrigeration Engineering Department places emphasis on both analysis and design. Supplementary to both is the basic work in drafting, shops, and laboratory. The department has modern, well-equipped laboratories and classrooms in which the work is organized to parallel closely the work done by engineers in the industry.

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

Field trips are taken each year to the Los Angeles and San Francisco areas to study outstanding construction and engineering projects.

A student branch of the American Society of Heating, Refrigeration, and Air Conditioning Engineers offers an active program of professional and social activity.

CURRICULUM IN AIR CONDITIONING AND REFRIGERATION ENGINEERING

Freshman

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* Shop Processes AC 141, MS 141, MS 142, IE 141, Weld 141, Weld 142.
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**Total:** 17 | 16 | 16

### Descriptions of Courses in Air Conditioning

**AC 118 Orientation (2)**

A survey of the applications of refrigeration and air conditioning, and a study of the qualifications required for various positions in the industry. 2 lectures.

**AC 121, 122, 123 Air Conditioning Drafting (2) (2) (2)**

Principles and practice of mechanical and architectural drafting applied to the installation of equipment, piping, and sheet metal. 1 lecture, 1 laboratory.

**AC 124 Duct Construction (3)**

Materials and techniques of low and high velocity duct construction. 1 lecture, 2 laboratories. Prerequisite: AC 121

**AC 131, 132 Plumbing System Design (2) (2)**

Materials and techniques used in piping of water, steam, brine, and refrigerant systems. Study of design procedures, installation practices, building and health codes. 1 lecture, 1 laboratory.

**AC 141 Shop Processes (1)**

Light gauge metal fabrication by spinning, rolling, bending, stretching, drawing; joining by soldering, riveting, and adhesives. 1 laboratory.

**AC 201, 202 Heating and Ventilating (3) (3)**

The study of heating and ventilating equipment and its application to industrial and public buildings. 3 lectures. Prerequisite: Phys 132. Concurrent: Chem 321, 322

† To be selected from the General Education list.
AC 231  Plumbing System Design (2)
Basic principles applying to the design of water and waste systems, fire protection, sprinkler systems, gas services for commercial and industrial buildings. 1 lecture, 1 laboratory.

AC 237  Boilers and Steam Equipment in Agriculture (2)
The operation and maintenance of steam equipment as applied to the agricultural industry. Course designed for students of the Agriculture Division. 2 lectures.

AC 238, 239  Refrigeration in Agriculture (2) (2)
Basic principles of refrigeration, compression systems, refrigerant control valves, motors, service analysis, operation and maintenance of refrigeration equipment. Course designed for students of the Agriculture Division. 2 lectures, winter; 1 lecture, 1 laboratory, spring.

AC 240  Additional Engineering Laboratory (1-2)
Elective project work. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories. Prerequisite: AC 124

AC 241, 242  Thermal Laboratory (2) (2)
Operation and maintenance of refrigeration systems. Instrument familiarization and calibration. Fundamental tests related to the heating, refrigeration, and air conditioning field. Performance test. 1 lecture, 1 laboratory. Prerequisite: Phys 132.
Concurrent: AC 201, 202

AC 250  Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201

AC 301, 302, 303  Thermodynamics of Refrigeration (3) (3) (3)
Basic Thermodynamics. Equations of state, laws, processes, and cycles including Rankine, Brayton, Compressor, Otto, and Diesel. Thermodynamic analysis of the following refrigeration systems and their components: Single stage vapor, multiple stage cascade, multiple stage compound, air, steam jet, and absorption. Refrigeration controls. Low temperature refrigeration. 3 lectures. Prerequisite: AC 202, Phys 133, Chem 322

AC 306  Survey of Heating and Air Conditioning (3)
Basic principles concerning comfort, health, load calculations and the space required for pipes, ducts, and equipment. Course designed for engineering majors other than air conditioning and refrigeration majors. 3 lectures.

AC 307, 308  Noise and Vibration Control (2) (2)
Noise and vibration through various media, simple and damped harmonic motion, elastic bases, architectural acoustics, noise and vibration prevention and attenuation in air conditioning systems. 2 lectures. Prerequisite: Phys 133, Math 203

AC 313  Heat Transfer (3)
Basic principles of heat transfer, radiation, conduction during steady state conditions, convection with gases and liquids, boiling and condensing of fluids during forced and gravity flow conditions. 3 lectures. Prerequisite: ME 311

AC 331, 332, 333  Thermal and Fluid Laboratory (2) (2) (2)
Laboratory tests in controls, thermodynamics, fluid flow, heat transfer and vibration. Performance testing of refrigeration systems, evaporators, condensers, fans, air washers, boilers, grilles, etc. 1 lecture, 1 laboratory, fall and winter; 2 laboratories, spring. Prerequisite: AC 202, 242. Concurrent: AC 301, 302, 303

AC 341, 342, 343  System Design (2) (2) (2)
Individual project work in planning of commercial and industrial heating and refrigeration systems. 2 laboratories. Prerequisite: AC 202. Concurrent: AC 307, 308
AC 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group study. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

AC 401 Advanced Heat and Vapor Transfer (3)
Transient heat flow, thermal storage, and cooling load, the mass transfer principle applied to combined heat and vapor transfer, selection of heat and vapor transfer equipment. 3 lectures. Prerequisite: AC 313

AC 402 Advanced Fluid Flow (3)
Centrifugal equipment design and performance loss coefficients for high velocity flow, the design of high velocity air conduits as applied to aeronautical, marine or public building air conditioning systems. 3 lectures. Prerequisite: ME 311

AC 403 Control Systems (2)
Circuit and thermodynamic analysis of electrical, electronic and pneumatic controls in air conditioning and refrigeration systems. Prerequisite: AC 442

AC 411 Air Pollution Control (3)
Air purification within structures, smog control, and the filtration of radioactive fall-out. An elective course primarily for air conditioning, architectural and mechanical juniors or seniors. Prerequisite: Phys 133, Chem 323

AC 441, 442, 443 Air Conditioning System Design (3) (3) (3)
Individual project work in planning of commercial and industrial air conditioning systems. 1 lecture, 2 laboratories. Prerequisite: AC 343. Concurrent: AC 401

AC 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

AC 463 Undergraduate Seminar (2)
Special studies and technical developments in the field. Individual reports on important research in the refrigeration and air conditioning field. 2 lectures. Prerequisite: Senior standing.
The Architecture and Architectural Engineering Department prepares graduates for careers in architecture and closely allied fields.

The educational preparation for the professional practice of architecture is a five-year curriculum culminating in the degree of Bachelor of Architecture. The department follows the national practice in this regard. The educational preparation for the professional practice of architectural engineering and related fields is a four-year curriculum culminating in the degree of Bachelor of Science in Architectural Engineering. The curriculum has major emphasis on structural engineering but is broad enough to provide entry into most phases of the construction industry.

The first two years of the curricula for Architecture and Architectural Engineering are identical. The student makes his choice of degree at the beginning of the junior year. He is given careful counseling by the faculty in making his selection. Additional work may be elected which will permit the graduates of both programs to enter the field of city planning.

The department facilities include design laboratories, dark room, calculator room, soils laboratory, stress laboratory, shops, construction yard, and project yard. An outlying area of several acres is available for extensive experimental construction of a semi-permanent nature.

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

CURRICULUM IN ARCHITECTURE AND ARCHITECTURAL ENGINEERING

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<td>Introduction to Drawing and Perspective (Arch 144)</td>
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<td>Delineation (Arch 145, 146)</td>
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<td>Freehand Drawing (Arch 140)</td>
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<td>Materials of Construction (Arch 106)</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Introduction to Urban Environment (Arch 211, 212)</td>
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<td>Strength of Materials (Arch 205, 206)</td>
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<td>Engineering Problems—Digital Computers (Arch 250)</td>
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<td>Engineering Surveying (AE 237)</td>
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### CURRICULUM IN ARCHITECTURE

#### Junior

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<td>History of Architecture (Arch 317, 318, 319)</td>
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<td>City Planning Laboratory (Arch 348, 349)</td>
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<td>Electrical Systems Design (EE 324)</td>
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<td>Professional Practice (Arch 441, 442, 443)</td>
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<td>Concrete and Masonry Structures (Arch 404, 405, 406)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Design Project (Arch 571, 572, 573)</td>
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<td>General Psychology (Ps 202)</td>
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* 10 units of electives must be approved by the department in terms of individual student objectives.

** To be selected from the General Education list.
Engineering Division

CURRICULUM IN ARCHITECTURAL ENGINEERING

Junior

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<td>Steel and Timber Structures (Arch 305, 306)</td>
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Senior

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<td>Soil Mechanics and Foundations (Arch 421, 422)</td>
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<td>Senior Project (Arch 461, 462)</td>
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17 17 19

DESCRIPTIONS OF COURSES IN ARCHITECTURE AND ARCHITECTURAL ENGINEERING

Arch 106  Materials of Construction (3)
The use and application of building materials, structural makeup of buildings. 3 lectures.

Arch 111  Introduction to Architectural Design (2)
Familiarization with the professional fields of architecture, engineering and city planning. Introduction to the design process and development as a basis for architectural analysis. 2 lectures.

Arch 132  Introduction to Architectural Design (2)
Continuation of Arch 111 stressing critical evaluation of man’s environment. 1 lecture, 1 laboratory. Prerequisite: Arch 111

Arch 140  Freehand Drawing (1)
Exercises in drawing without mechanical aids. Total credit limited to 3 units, not more than 1 unit in any one quarter. 1 laboratory.

Arch 143  Introduction to Architectural Design (2)
Continuation of Arch 132. Study of visual phenomena with application to elementary composition dealing with line, area, color and materials. 2 laboratories. Prerequisite: Arch 132

Arch 144  Introduction to Drawing and Perspective (3)
Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

** To be selected from the General Education list.
Arch 145, 146 Delineation (2) (2)

Three-dimensional representations with various drawing media which enable the
student to express his architectural ideas. 2 laboratories. Prerequisite: Arch 144

Arch 153 Industrial Presentation Techniques (2)

Graphic presentation for industrial engineers. Symbols, techniques, and freehand
drawing. Construction drawings and flow diagraming. 2 laboratories.

Arch 205, 206 Strength of Materials (3) (3)

Physical properties of construction materials. Moment and shear diagrams; axial
and eccentric loading; deflection. Sizing of structural members of homogeneous
and compound materials. 3 lectures. Prerequisite: Phys 131, Math 201

Arch 211, 212, 213 Introduction to Urban Environment (2) (2) (2)

History and analysis of events and social factors which have influenced the
physical growth of cities. Evolution of city planning as a profession. Community
organization and current city planning practices. 2 laboratories. Prerequisite: Eng 106

Arch 231, 232, 233 Architectural Practice (3) (3) (3)

Construction techniques and working drawings for wood frame and steel frame
structures. Theory and application of laws and codes affecting buildings. Theory
and application of cost estimating procedures. 1 lecture, 2 laboratories. Prerequi-
site: Arch 106, 144

Arch 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.

Arch 241, 242, 243 Watercolor (1) (1) (1)

Outdoor sketching with watercolor. 1 laboratory. Prerequisite: Arch 146

Arch 250 Engineering Problems—Digital Computers (1)

Solution of selected engineering problems by means of digital computers. 1 lab-
aboratory. Prerequisite: Math 201

Arch 251, 252, 253 Basic Design (3) (3) (3)

Continuation of Arch 143. Development of design skills through studies of spatial
problems of increasing architectural complexity. Circulation, flow, and human
needs with respect to architecture. One designated field trip required. 3 laboratories.
Prerequisite: Arch 143, 146

Arch 304 Stress Analysis (3)

Stress analysis of statically determinate and indeterminate structures. 3 lectures.
Prerequisite: Arch 206

Arch 305, 306 Steel and Timber Structures (3) (3)

Design of steel members and connections, ties, trusses, plate girders, and deter-
minate frames. Vertical and lateral loading. Light frame wood buildings, trusses,
glued laminated wood arches, and connections. 3 lectures. Prerequisite: Arch 304

Arch 312 Home Design (3)

For students not majoring in architecture. Historical development of the home
and the effect of location, climate, social and technological factors on home design.
Considerations and design methodology; furniture, landscape, and relation of home
to community environment. 3 lectures.

Arch 314, 315, 316 Design Theory (3) (3) (3)

For engineering students. Studies in architectural design with emphasis on struc-
tural relationships. 3 lectures. Prerequisite: Arch 253

Arch 317, 318, 319 History of Architecture (2) (2) (2)

Periods of architecture; philosophies and conditions which influenced them. 2 lec-
tures. Prerequisite: Eng 106
Arch 322, 323 Model Analysis (2) (2)
Development of structural understanding by non-mathematical methods through the observation of models under load conditions. Introduction to model techniques of stress determination. 1 lecture, 1 laboratory. Prerequisite: Arch 206

Arch 341, 342, 343 Architectural Practice (2) (2) (2)
Continuation of Arch 233. Masonry and concrete structures. Theory and application of specifications. Coordination with Architectural Design. One designated field trip required. 2 laboratories. Prerequisite: Arch 233

Arch 344 Stress Analysis Laboratory (1)
Standard tests of structural materials and structural components. Use of test equipment and strain gages. 1 laboratory. Prerequisite: Arch 206, Chem 321

Arch 348, 349 City Planning Laboratory (1) (1)
Application of city planning theory and principles to classroom and field problems. 1 laboratory. Prerequisite: Arch 212

Arch 351, 352, 353 Architectural Design (4) (4) (4)
Continuation of Arch 253. Development of logical analysis and creative abilities through application of skills to the solution of architectural problems. 4 laboratories. Prerequisite: Arch 206, 233, 253

Arch 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

Arch 401, 402, 403 Design Theory (2) (2) (2)
Continuation of Arch 316. 2 lectures. Prerequisite: Arch 316

Arch 404, 405, 406 Concrete and Masonry Structures (2) (2) (2)
Elements and design of concrete and masonry structures. Vertical and lateral loading in multi-story buildings. 2 lectures. Prerequisite: Arch 306, 344; Math 203; Phys 133

Arch 414, 415, 416 General Engineering (2) (2) (2)
Topics which serve to supplement and unify the professional engineering background. 2 lectures. Prerequisite: Arch 306, 344; Math 316; Chem 321; Phys 133

Arch 417, 418, 419 History of Architecture (2) (2) (2)
Arch 319 continued. Periods of architecture; philosophies and conditions which influenced them. 2 lectures. Prerequisite: Arch 319

Arch 421, 422 Soil Mechanics and Foundations (3) (3)
Principles and applications of soil mechanics; types of foundation construction; design of foundations for buildings and bridges. 2 lectures, 1 laboratory. Prerequisite: Arch 306; Math 316; Phys 133; Chem 321

Arch 423 Experimental Stress Analysis (3)
Stress determination by model analysis. Brittle coatings, photoelastic methods and strain gages. Advanced topics. 2 lectures, 1 laboratory. Prerequisite: Arch 444

Arch 441, 442, 443 Professional Practice (2) (2) (2)
Comprehensive projects in architecture involving office organization. Contract documents. Ethics. Drawings for buildings with coordinated engineering and specifications. Field trips. 2 laboratories. Prerequisite: Arch 306, 343

Arch 444, 445, 446 Structural Design (5) (5) (5)
Stress analysis of long-span structures, arches, influence lines, built-up girders, multiple-storied rigid frame structures, prestressed concrete, shells and domes. Dams and bridges. Advanced topics from current engineering practice. 5 laboratories. Prerequisite: Arch 306, 343, 344; Math 316
Arch 451, 452, 453  Architectural Design (5) (5) (5)

Continuation of Arch 353. Problems of increasing architectural complexity with emphasis placed on comprehensive solutions. 5 laboratories. Prerequisite: Arch 306, 343, 353

Arch 461, 462  Senior Project (2) (2)

Selection and completion of a comprehensive type project under a minimum of supervision. Problems to involve the students' technical and creative skills. Construction encouraged. 120 hours minimum total time. Prerequisite: Arch 306, 343

Arch 463  Undergraduate Seminar (2)

Discussion and lectures on problems of practice and the building industry. Professional ethics. Students present organized material on some subject of interest in architectural engineering or architecture. 2 two-hour meetings. Prerequisite: Arch 462

Arch 551, 552, 553, 554  Architectural Design (5) (5) (5) (5)

Continuation of Arch 453. Stressing professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the shaping of the total environment. 5 laboratories. Prerequisite: Arch 406, 443, 453

Arch 571, 572, 573  Design Project (2) (2) (2)

A comprehensive architectural design project chosen by the student which will challenge his 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. Concurrent: Arch 551, 552, 553
The program in Electrical Engineering prepares the student for a career in the technological utilization of electric energy.

With a continuing emphasis on design and creativity, a careful curricular balance of the humanities, social and physical sciences, mathematics, and engineering disciplines is maintained with integration of mechanisms, materials, energy, men and environment.

The electrical engineering courses deal with electric and magnetic fields and waves; machines, energy conversion and transfer; instrumentation; information generation, conversion, transmission and reduction; automatic control and computers.

The freshman year introduces the student to the basic concepts of electrical engineering and gives him training in handling electrical devices and equipment in the shop and laboratory.

Beginning with the sophomore and extending into the senior year, the student advances his understanding of electrical engineering through classroom and laboratory study and gains application experience with devices, networks and systems, progressing from the simple to the complex as his supporting course work attains higher levels of sophistication.

A large portion of the senior year is devoted to individual and independent study, seminars, elective courses and is culminated in a senior project, which is an investigative study or development in an area of special interest to the student. It often results in the design and construction of a useful device (sometimes patentable) or the simulation and study of a problem on a mathematical or physical model such as a computer.

Attention is called to courses EE 104, 154, 204, 205, 244, and 255 which are especially structured to assist junior college transfer students in their transition into the department curriculum.

The life of the student may be enriched by participation in the two clubs sponsored by the department: Student Branch of the Institute of Electrical and Electronic Engineers, a technical organization; and the Poly Phase Club, a social club.

**CURRICULUM IN ELECTRICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<tr>
<td>Fundamentals of Electrical Engineering (EE 101, 102, 103)</td>
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<tr>
<td>Electric Shop (EE 141)</td>
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<td>Electrical Design Graphics (EE 146)</td>
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<td>Orientation (EE 151)</td>
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<td>Engineering Drafting (ME 151, 152)</td>
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<td>Shop Processes (Math 111)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>General Physics (Phys 131, 132)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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| Total | 17½ | 18½ | 16½ |

* AC 141, MS 141, MS 142, IE 141, Weld 141, Weld 142.
### Sophomore Courses

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<tr>
<td>Fundamentals of Electrical Engineering (EE 201, 202, 203)</td>
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<td>Electric Laboratory (EE 241, 242, 243)</td>
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<td>Electric Shop (EE 253)</td>
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<td>Engineering Problems—Digital Computers (EE 250)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Differential Equations (Math 316)</td>
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<td>Introduction to Optics and Atomic Physics (Phys 211)</td>
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<td>Circuits Laboratory (EE 342, 343)</td>
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<td>Electronics (EE 314, 315, 316)</td>
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<td>Differential Equations (Math 317)</td>
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<td>Advanced Engineering Mathematics (Math 319)</td>
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<td>Methods of Numerical Analysis (Math 332)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>U. S. in World Affairs (Hist 305)</td>
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<td>Principles of Economics (Ec 201)</td>
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### Senior Courses

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<td>Control Systems (EE 401)</td>
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<td>Electrical Engineering Design (EE 422)</td>
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<td>Control Systems Laboratory (EE 441)</td>
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<td>Senior Shop (EE 451)</td>
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<td>Senior Project (EE 461, 462)</td>
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<td><strong>Total Units</strong></td>
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### Descriptions of Courses in Electrical Engineering

EE 101, 102, 103  **Fundamentals of Electrical Engineering**  (2) (2) (2)

Fundamental concepts. Unit systems. Basic laws. Direct and alternating current circuits. 2 lectures. EE 101 concurrent with Math 117.

EE 104  **Fundamentals of Electrical Engineering**  (5)

Covers the material in EE 101, 102, 103. For transfers from junior colleges or colleges who have completed one semester of calculus. Not open to regular freshmen. 5 lectures.

**Industrial Relations (IR 312) may be substituted.**

†To be selected from the General Education list.
EE 122 Electrical Analysis (2)
Elements of electricity; simple electric and magnetic circuits. Electric circuit drawings, codes and wiring. DC and AC machine windings and construction. 1 lecture, 1 laboratory.

EE 141 Electric Shop (1)
Electrical materials, tools, equipment and their use. Modern shop techniques. 1 laboratory.

EE 146 Electrical Design Graphics (1)
Single line, three line, and schematic representation of electric and electronic circuits, solid state devices, transducer elements and machines. Graphic layout. Industrial standards. 1 laboratory. Prerequisite: ME 152

EE 151 Orientation (1)
Familiarization with the field of electrical engineering. Development of techniques useful to the student in his academic progress. 1 laboratory.

EE 152, 153 Electric Laboratory (1) (1)
How to set up experiments, take laboratory notes and write reports. Elementary work with meters and circuit elements. 1 laboratory. Prerequisite: EE 101, 102

EE 154 Electric Laboratory (2)
Covers material in EE 152 and EE 153. For junior college or college transfers who are registered in EE 104. Not open to regular freshmen. 2 laboratories.

EE 201, 202, 203 Fundamentals of Electrical Engineering (3) (3) (3)
Networks, Network theorems. Coupled systems. Polyphase systems. Electric and magnetic fields. Maxwell's equations. Introduction to traveling waves and radiation. 3 lectures. Prerequisite: Math 201

EE 204 Fundamentals of Electrical Engineering (5)
Covers the material in EE 201 and half of EE 202. For junior college or college transfers. 5 lectures. Prerequisite: EE 104 or equivalent.

EE 205 Fundamentals of Electrical Engineering (5)
Covers the material in second half of EE 202 and EE 203. Continuation of EE 204. 5 lectures. Prerequisite: EE 204

EE 207 Electrical Engineering Circuits (3)
Fundamental electric laws. Electric circuits and circuit theorems. Magnetism and magnetic circuits. Analysis of alternating current, single and three phase circuits using symbolic method (complex phasors). Transmission lines, coupled circuits and transients. For non-electrical engineering majors. 3 lectures. Prerequisite: Math 201, Phys 133. Concurrent: EE 251

EE 208 Electric Machines and Controls (3)
The fundamentals of electro-mechanical energy conversion. Theory of operation and operating characteristics of transformers, D.C. machines and A.C. induction and synchronous machines. Electrical control devices and systems. For non-electrical engineering majors. 3 lectures. Prerequisite: EE 207. Concurrent: EE 252

EE 223 Wiring and Codes for Architects (3)

EE 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.
EE 241, 242, 243 Electric Laboratory (1) (1) (1)
Calibration and use of electrical measuring instruments. Selected laboratory exercises in electrical engineering. 1 laboratory. Concurrent: EE 201, 202, 203

EE 244 Electric Laboratory (2)
Covers material in EE 241 and 242. For Junior College or College Transfers who are registered in EE 204. 2 laboratories.

EE 245 Electric Laboratory (2)
Covers material in EE 243 and EE 253. For Junior College or College Transfers who are registered in EE 205. 2 laboratories.

EE 250 Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201

EE 251, 252 Electrical Engineering Laboratory (1) (1)
Use of electric meters. Experiments and exercises involving direct and alternating current circuits, machines and their controls. 1 laboratory. Concurrent: EE 207, 208

EE 253 Electric Shop (1)
Construction maintenance, and operation of electrical machines. 1 laboratory. Concurrent: EE 203

EE 301, 302, 303 Electric Circuits (3) (3) (3)

EE 304, 305, 306 Electric Machines (2) (3) (3)
Extension of circuit theory to machines. Transformers. Induction, synchronous, direct current and special machines. 2 lectures, fall; 3 lectures, winter and spring. Prerequisite: EE 203

EE 313 Electric Machines (3)
Physical and electrical characteristics of the more common types of DC and AC machinery. Provides background facilitating selection of appropriate machine for a specific job. 3 lectures. Prerequisite: EL 206

EE 314, 315, 316 Electronics (3) (3) (3)
Electron tubes. Transistors. Active networks. 3 lectures. Prerequisite: EE 203

EE 327 Illumination (3)
Theory and practice of illumination. Mechanical and electrical problems in installation and control of lighting sources. Measurement of light. 2 lectures, 1 laboratory. Prerequisite: EE 203 or EE 208 or EE 223

EE 342, 343 Circuits Laboratory (1) (1)
Study of electric circuits in the laboratory. Distributed constant systems. 1 laboratory. Concurrent: EE 301, 302

EE 344, 345, 346 Electric Machine Laboratory (1) (1) (1)

EE 354 Electronics Shop (1)
Shop technique of constructing systems using electronic devices. 1 laboratory. Concurrent: EE 314
EE 355, 356  Electronics Laboratory (1) (1)
Electron tube characteristics. Transistor characteristics. Study of active networks. 1 laboratory. Concurrent: EE 315, 316

EE 400  Special Problems for Advanced Undergraduates (1-2)
Arrangements to be made with department head. Limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

EE 401  Control Systems (3)
Fundamentals of automatic feedback control systems. Analysis and introduction to design of linear systems. 3 lectures. Prerequisite: EE 303

EE 402  Control Systems Engineering (3)
An advanced course in analysis and design of control systems based on root-locus, frequency domain and computer approach. Non-linear sampled data and self-adaptive systems. 3 lectures. Prerequisite: EE 401 or permission of instructor.

EE 403  Digital Computers (2)
Theory of operation. Design. Application to control of machines and systems. 2 lectures. Prerequisite: EE 316 or permission of instructor.

EE 404  Analog Computers (2)
Introduction to analog techniques. Analog solution of dynamic problems. System simulation on analog computers. Analog computer as an aid in design problems. 2 lectures. Prerequisite: Math 316

EE 407  Power System Analysis (3)
Equivalent circuits. Sequence impedances. Symmetrical components. Faults and sudden loads. 3 lectures.

EE 422  Electrical Engineering Design (5)
Application of engineering analysis to design problems. Creative thinking emphasized. Group and individual assignments. 2 lectures, 3 laboratories. Prerequisite: senior standing in Electrical Engineering.

EE 428  Dynamic Instrumentation (3)
Electrical measurement of non-electrical phenomena. Transducers. Transmission systems. Recorders. Theory and operation. 2 lectures, 1 laboratory. Prerequisite: EE 303, 315

EE 441  Control Systems Laboratory (1)
Advanced servomechanisms laboratory arranged for individual study. 1 laboratory. Concurrent: EE 401

EE 442  Control Systems Laboratory (1)
Individual study of advanced control systems. 1 laboratory. Prerequisite: permission of instructor.

EE 443  Digital Computer Laboratory (1)
Laboratory study of digital computer circuits. Memory systems, associated controls. 1 laboratory. Prerequisite: EE 356 or permission of instructor.

EE 444  Analog Computer Laboratory (1)
Solution of typical engineering problems by analog methods. 1 laboratory. Concurrent: EE 404
EE 451  Senior Electrical Engineering Shop (1)

Individual project fabrications resulting from student's creativity and employing previously learned skills of analysis and synthesis. Emphasis on professional development. 1 laboratory. Prerequisite: Senior standing in Electrical Engineering.

EE 461, 462  Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

EE 463  Undergraduate Seminar (2)

Special studies and recent technical developments in the field. Student presentation of topics, class panel discussion. Survey of recent publications. 2 meetings.

EE 466  Ethics in Engineering (2)

Introduction to business and legal aspects of engineering. Ethics as applied to the practice of engineering. 2 seminars.
The program of the Electronic Engineering department prepares students for the branch of engineering which deals with the generation, transmission, reception and utilization of signals for all types of communication, automatic control and high speed computation.

The instructional program is product-oriented, therefore it is concerned chiefly with engineering studies basic to product development, design, manufacturing, application and service. This goal is achieved by presenting fundamental knowledge and simultaneously encouraging development of skills in the art of engineering. The laboratory, shop and engineering drawing room activities are of equal importance with the classroom lecture activity. The student works in an environment which conditions him to derive creative satisfaction from true engineering achievement which is essentially a learn-by-doing activity.

The four-year program is planned so that the student starts with a series of freshman courses in his major and in related skills. Simultaneously he is preparing himself in mathematics and physics for later engineering-level courses which follow the calculus. This plan provides (1) an opportunity to explore a chosen field upon entering college, (2) skills and techniques for early employment, and (3) strong motivation for the study of mathematics and physics.

The core of the program consists of two carefully integrated six-quarter sequences in the sophomore and junior years: (1) a sequence in basic circuit theory using modern methods of analysis by pole-zero patterns in the complex frequency plane and linear transform theory of electronic, mechanical and electromechanical systems, (2) a parallel sequence in the physics and circuitry of linear and non-linear electron devices, with an introduction to pulse circuitry. In the senior year the student may explore such subjects as microwave electronics, advanced amplifier theory, computer and control systems, communication theory and network synthesis with treatments based on the level of analysis developed in earlier courses.

The associated laboratory work provides a constant interplay between the analytical and the experimental disciplines of engineering, with special emphasis on the science of measurement and the technology of instrumentation. Those students who desire to be more science oriented, may elect additional courses in mathematics and physics; while those students who desire to be more business oriented may elect related courses in industrial engineering and business management.

An effort is made to teach fundamentals and basic principles through realistic situations. Progress is from the specific and practical case to the general principle. Emphasis is placed on the problem-solution technique of teaching. In contrast with many colleges, the courses in general education are spread throughout the four years. Skill in written and oral communication is developed early, while the social-humanistic studies appear in the junior and senior years.

The learning-process and the doing-process are brought into sharp focus in the senior year when the student engages in constructive project work which draws on all phases of his training. It is here that the student is impressed with the fundamental fact that engineers are paid to put ideas, processes and hardware together to create something that people need or want. The goal is to synthesize the known and useful, rather than to search for the unknown. Such activity calls for judgment and compromise, and helps to close the gap between principle and practice.

The department occupies a modern facility which has been carefully designed for this type of engineering education. Included are five large and extensively equipped laboratories, a project room with adjoining model shop and several auxiliary rooms.

Two organized clubs sponsor a very active program of professional and extracurricular events: the Student Branch of the Institute of Electrical and Electronic Engineers and the amateur Radio Club which operates a modern and well-equipped station W6BHZ.
## CURRICULUM IN ELECTRONIC ENGINEERING

### Freshman

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<td>Engineering Drawing (ME 151, 152)</td>
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<td>* Shop Processes</td>
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<td>Physical Education (PE 141)</td>
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| Total                                                                 | 17½ | 18½ | 18½ |

### Sophomore

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<td>Digital Computer Programming (EL 250)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Differential Equations (Math 316)</td>
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<tr>
<td>Introduction to Optics and Atomic Physics (Phys 211)</td>
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<td>Engineering Statics (Phys 201)</td>
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| Total                                                                 | 17½ | 17½ | 17½ |

### Junior

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<td>Linear Systems Analysis (EL 301, 302, 303)</td>
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<tr>
<td>Networks Laboratory (EL 341, 342)</td>
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<td>Analog Computer Laboratory (EL 343)</td>
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<td>Electronic Circuits Laboratory (EL 344, 345, 346)</td>
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<td>Design in Electronics Production (EL 309)</td>
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<td>Electric Machines (EE 313)</td>
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<td>Thermodynamics (ME 308)</td>
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<td>Heat Transfer (ME 309)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>** Industrial Management (IR 311)</td>
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<td>Differential Equations (Math 317)</td>
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| Total                                                                 | 16 | 17 | 18 |

* AC 141, IE 141, MS 141, MS 142, Weld 141, Weld 142.
** Industrial Relations (IR 312) may be substituted.
† To be selected from the General Education list.
Engineering Division

Senior

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<th>Course Description</th>
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<tr>
<td>Microwave Electronics (EL 401, 402, 403)</td>
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<td>Principles of Digital Computers (EL 404)</td>
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<td>Advanced Amplifier Theory (EL 405)</td>
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<td>Communication Theory (EL 406)</td>
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<td>Electronic Systems Engineering (EL 441, 442, 443)</td>
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<td>Senior Project (EL 461, 462)</td>
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<td>Solid State Physics (Phys 412)</td>
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<td>American Government (Pol Sc 301)</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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*Approved Senior Courses----------------------

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<td>American Government (Pol Sc 301)</td>
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17 18 17

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<tr>
<td>EL 101, 102 Elements of Electronics (2) (2)</td>
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<tr>
<td>Fundamentals of electronic components and unit circuits. Application of unit circuits in some electronic systems. Elementary electronic instrumentation and industrial control. Introduction to both the analog and digital computers with application to engineering problems. For majors in Aero, AC, IE, ME, and WM. 2 lectures.</td>
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<tr>
<td>EL 111, 112 Introductory Electronics (2) (2)</td>
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<tr>
<td>Basic principles of charge control in solids and vacuum. Fundamentals of electronic components and unit circuits. Application of unit circuits in selected electronic systems. 2 lectures.</td>
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<tr>
<td>EL 113 Electronic Instruments (2)</td>
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<tr>
<td>Analysis of selected basic electronic instruments and their application to measurement in the field of electronic engineering. Introduction to both the analog and digital computers with solution of appropriate mathematical problems. 2 lectures. Prerequisite: EL 112, Math 118, Phys 131</td>
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<td>EL 141, 142 Electronics Laboratory (1) (1)</td>
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<td>Directed experimental work with the motion and control of charges in solids and vacuum. Properties of components and functions of basic circuits. Electronic instrumentation and computation in engineering. 1 laboratory. Concurrent: EL 101, 102</td>
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<td>EL 146 Graphics in Electronics (1)</td>
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<td>Schematic drafting and delineation. Electronic and industrial symbols. Printed circuits. Technical sketching. 1 laboratory. Prerequisite: ME 151, EL 102</td>
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<td>EL 151, 152 Experimental Electronics (1) (1)</td>
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<td>Experimental study of the properties of components, unit circuits, and selected electronic systems. 1 laboratory. Concurrent: EL 111, 112</td>
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<tr>
<td>EL 153 Electronic Instruments Laboratory (1)</td>
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<tr>
<td>Directed projects investigating the more common electronic instruments and their use in measuring voltages, current, waveform, frequency, and phase. Introductory study of elements of the analog and digital computers. 1 laboratory. Concurrent: EL 113</td>
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* Network Synthesis (EL 411), Principles of Analog Computers (EL 412), or Control Systems Engineering (EL 413, 414). Other courses may be elected with the approval of the department head.
EL 156  Electronic Project (1)
A directed project in which the student builds, tests and evaluates the performance of some electronic device. Student must purchase own materials. 1 laboratory. Concurrent: EL 153

EL 204, 205, 206  Introductory Circuit Analysis (2) (3) (3)
Electric and magnetic circuits. Power and energy relationships. Integrated transient and steady-state analysis of linear direct and alternating current circuits with use of mesh and note approach. Network theorems, determinants, duality, phasor and complex-frequency concepts, exponential Fourier analysis. 2 lectures, 3 lectures, 3 lectures. Concurrent: EL 207 with EL 204

EL 207  Physical Electronics (3)
Logically ordered introduction of the basic physical concepts underlying the study of electronics. Emphasis on electrical and magnetic field theory and the controlled motion of charged particles. 3 lectures. Prerequisite: Phys 132, Math 201

EL 208  Electron Devices (3)
Electrical properties of materials. Physical analytical study of some semiconductor and vacuum diodes. Equivalent circuit study of these devices with resistive loads. Emphasis on graphical analysis of circuits. 3 lectures. Prerequisite: EL 204, EL 207, Phys 211

EL 209  Electron Devices (2)
Analytical study of transistors and electron tubes. Small-signal equivalent circuit analysis and graphical analysis of these devices. 2 lectures. Prerequisite: EL 205, EL 208

EL 213  Introductory Circuit Analysis (3)
Development of the fundamentals of circuit analysis, beginning with the total response of circuits to general driving functions. Study of the mechanical analogs of the three electrical parameters. Primarily for Aeronautical Engineering majors. 3 lectures. Prerequisite: Phys 133, EL 102, EL 142. Concurrent: Math 316

EL 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.

EL 245, 246  Introductory Circuits Laboratory (1) (1)
Selected laboratory experiments in the subject matter of EL 204, 205, 206. Emphasis placed on laboratory procedure in collecting, correlating, graphing, and evaluating laboratory data. 1 laboratory. Concurrent: EL 205, 206

EL 248, 249  Electron Devices Laboratory (1) (1)
Fundamental experiments investigating the physical and electrical properties of the more common types of semiconductor devices and electron tubes. Emphasis on collecting, correlating, graphing, and evaluating laboratory data. 1 laboratory. Concurrent: EL 208, EL 209

EL 250  Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201

EL 253  Circuits Laboratory (1)
Experiments involving the measurement of operational characteristics of basic circuits and devices with emphasis on the methods of measurements. 1 laboratory. Concurrent: EL 213
EL 301, 302, 303 Linear System Analysis (2) (2) (2)
The response of linear electronic, mechanical and electromechanical systems to various excitations using principally Fourier and Laplace transform methods. Analysis and synthesis of one and two port frequency selective networks with fixed and distributed parameters. Butterworth and Chebyshev polynomials. Stability in feedback systems. 2 lectures. Prerequisite: EL 206

EL 304 Electronic Circuits (3)
Small signal analysis of transistor and electron tube audio and video amplifiers, cascaded stages and feedback amplifiers. Graphical analytical study of large signal power amplifiers. 3 lectures. Prerequisite: EL 206, Math 316

EL 305 Electronic Circuits (3)
Analytical study of oscillator, modulator, frequency-changer and demodulator circuits for amplitude, frequency and phase modulation systems. Application to communication and instrumentation systems. 3 lectures. Prerequisite: EL 304

EL 306 Electronic Circuits (3)
Graphical and quasi-analytical study of wave shaping, pulse forming, and timing circuits; multivibrators, blocking oscillators, switching devices utilizing nonlinear devices. Major emphasis on solid state circuits. 3 lectures. Prerequisite: EL 302, 305

EL 309 Design in Electronics Production (2)
Analysis of some of the basic mechanical, electronic, thermal problems in the packaging of electronic equipment with special consideration given to reliability, maintainability and design for extreme environments. 2 lectures. Prerequisite: EL 305

EL 311 Introductory Electromechanics (3)
Development of the unifying operational principles of electromechanical devices. Formulation of the operational differential equations and solution by transform methods. Transfer functions, block diagram and systems concepts. Primarily for Aeronautical Engineering majors. 3 lectures. Prerequisite: EL 213. Concurrent: Math 317

EL 313 Analog Computer Techniques (3)
Course designed for mathematics, science and engineering majors other than electronic and electrical. Fundamental principles of analog computers, field of application in science and engineering. Programming techniques. Output devices. Simulation of linear and non-linear systems. 2 lectures, 1 two-hour activity period. Prerequisite: Math 203

EL 314 Digital Computer Techniques (3)
Course designed for mathematics, science and engineering majors other than electronic and electrical. Fundamental principles of digital computers, field of application in science and engineering. Programming. 2 lectures, 1 two-hour activity period. Prerequisite: Consent of instructor

EL 321 Electronic Engineering (3)
Elements of electronics with emphasis on the theory, operation and application of some of the more common types of electronic instruments. Course designed for engineering majors other than electrical and electronic. 3 lectures. Prerequisite: EE 207, 208

EL 322 Applied Electronics (3)
Characteristics of electronics systems and instruments with emphasis on applications in measurement and control of industrial processes. Methods of control for sequential and continuous operations. Course designed for engineering majors other than electrical and electronic. 3 lectures. Prerequisite: EL 321, 354
EL 341, 342 Networks Laboratory (1) (1)
Experimental study of alternating current network characteristics, filters and transmission lines. Use of transmission lines as circuit elements. Impedance charts. 1 laboratory. Concurrent: EL 301, 302

EL 343 Analog Computer Laboratory (1)
Laboratory study of analog computers and auxiliary equipment. Solution of engineering problems and simulation of physical systems on the analog computer. 1 laboratory. Prerequisite: EL 304

EL 344 Electronic Circuits Laboratory (1)
Laboratory analysis of audio and video frequency voltage and current amplifiers using transistors and electron tubes. Performance testing of amplifiers using EIA-IEEE Standard procedures. 1 laboratory. Concurrent: EL 304

EL 345 Electronic Circuits Laboratory (1)
Laboratory analysis of power and tuned amplifiers using transistors and electron tubes. Study of modulated waves and frequency conversion. 1 laboratory. Concurrent: EL 305

EL 346 Electronic Circuits Laboratory (1)
Laboratory analysis of wave shaping and pulse forming circuits with major emphasis given to solid state circuitry. Pulse measuring techniques. 1 laboratory. Concurrent: EL 306

EL 351 Electromechanics Laboratory (1)
Experimental study of the operational characteristics and simple system application of electromechanical transducers. 1 laboratory. Concurrent: EL 311

EL 354 Electronic Engineering Laboratory (1)
Fundamental experiments designed to familiarize the student with amplification, oscillation, detection applied to noncommunication circuits. Emphasis placed on the use of electronic instruments. 1 laboratory. Concurrent: EL 321

EL 355 Applied Electronics Laboratory (1)
Fundamental experiments designed to familiarize the student with amplification, and control systems for automatic control of sequential and continuous processes. 1 laboratory. Concurrent: EL 322

EL 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group study. Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories. Senior status required.

EL 401, 402, 403 Microwave Electronics (2) (2) (2)
Fundamentals of transit-time devices for the generation of microwaves. Development of Maxwell's equations and the wave equation with emphasis on physical concepts and application to guided waves. 2 lectures. Prerequisite: EL 303

EL 404 Principles of Digital Computers (3)
Digital arithmetic techniques. Switching algebra, logical design, simplification and realization of combinational circuits. Design of transistor logic circuits, digital subsystems such as counters, adders and registers. 3 lectures. Prerequisite: EL 306

EL 405 Advanced Amplifier Theory (3)
Analysis and synthesis of amplifier networks using solid state and electron tube active elements. Transient analysis of high speed, high gain amplifiers. Pole-zero analysis of bandpass amplifiers. Noise analysis. 3 lectures. Prerequisite: EL 303, EL 306

EL 406 Communication Theory (3)
A unified treatment of various types of transmission systems with emphasis on the role of system bandwidth and noise in limiting the transmission of information. Solid state and electron tube circuitry. 3 lectures. Prerequisite: EL 405
EL 411  Network Synthesis (3)
Modern circuit synthesis concepts and methods as applied to typical communication and control systems. Treatment of the approximation problem and techniques of network realization. 3 lectures. Prerequisite: EL 303

EL 412  Principles of Analog Computers (2)
Principles and practice of analog computation and simulation; programming and scaling techniques. Application to problems in engineering, mathematics, and physics with special emphasis on non-linear techniques including function multiplication and generation. Output devices. 2 lectures. Prerequisite: EL 343

EL 413  Control Systems Engineering (3)
Analysis and design and feedback control systems, root-locus and frequency response techniques. Systems performance criteria, methods of improving transient and steady-state response by use of compensating filter techniques. 3 lectures. Prerequisite: EL 303

EL 414  Control Systems Engineering (2)
Analysis and design of control systems using the electronic analog and digital computer approach. Non-linear problems, self-adaptive control systems and computer process control. 2 lectures. Prerequisite: EL 413

EL 441, 442, 443  Electronic Systems Engineering (1) (1) (1)
Advanced laboratory study dealing with subject matter of the senior lecture courses. Work takes on the aspects of project engineering. 1 laboratory. Concurrent registration in a senior year lecture course.

EL 461, 462  Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Project results are presented in a formal report. Minimum 120 hours total time.

EL 463  Undergraduate Seminar (2)
Discussion of new developments in the fields of communications and industrial electronics, with particular reference to fields of employment. Job analysis. 2 lectures
Industrial Engineering is concerned with the design of engineering systems and management systems. With relation to engineering systems, industrial engineering is the science of utilizing and coordinating men, equipment and materials to attain a desired quantity and quality of output at a specified time and at the most favorable cost. With relation to management systems, it is the science of effective utilization of the human resources of an enterprise, accomplished through the design of integrated systems by the application of management principles and techniques.

The industrial engineer has responsibility in matters of design of systems which may be involved in areas of labor management, cost reduction and control, quality control, methods, planning, plant layout and data processing. He works closely with, and must understand the employee and the operating problems of management. This curriculum prepares graduates for positions in all phases of the system design in these areas of job activities.

The curriculum, leading to the Bachelor of Science Degree, combines a thorough understanding of the fundamentals of engineering with a broad background in manufacturing processes, statistics, accounting, economics, social sciences and management principles.

Excellent industrial engineering laboratories are available in the areas of Work Measurement, Systems and Procedures, Manufacturing Management, Manufacturing Processes, Metrology, and Quality Control.

**CURRICULUM IN INDUSTRIAL ENGINEERING**

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<th>Course</th>
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<td>Introduction to Industrial Engineering (IE 101)</td>
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<td>Systems and Procedures (IE 132, 133)</td>
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<td>Engineering Analysis (IE 121)</td>
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<td>Elements of Electronics (EL 101, 102)</td>
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<td>Electronics Laboratory (EL 141, 142)</td>
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<td>Shop Processes</td>
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<td>Engineering Drafting (ME 151, 152, 143)</td>
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<td>Industrial Presentation Techniques (Arch 153)</td>
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16½  17½  16½

* AC 141, MS 141, MS 142, IE 141, Weld 141, Weld 142.
## Engineering Division

### Sophomore

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<td>Production Tooling and Design (IE 231)</td>
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<td>Industrial Inspection (IE 232)</td>
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<td>Materials Handling (IE 203)</td>
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<td>Engineering Problems—Digital Computer (IE 250)</td>
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<td>General Physics (Phys 131, 132, 133)</td>
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<td>Principles of Economics (Ec 201)</td>
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### Junior

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<td>Manufacturing Planning: Process Planning (IE 322)</td>
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<td>Manufacturing Planning: Plant Layout (IE 323)</td>
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<td>Production Control (IE 334)</td>
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<td>Production Programming (IE 335)</td>
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<td>Mathematics of Statistics (Math 321)</td>
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### Senior

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<td>Advanced Motion and Time Study (IE 434)</td>
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† To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN INDUSTRIAL ENGINEERING

IE 101  Introduction to Industrial Engineering (2)
Historical development of the industrial economy. The role of industrial engineering in the business enterprise. Basic principles of industrial management and organization. Review and analysis of the components of an industrial organization such as sales, personnel, engineering, purchasing, and production control. Fundamentals of administration. 2 lectures.

IE 121  Engineering Analysis (2)
Study of the techniques used in compiling and preparation of data for engineering reports. Engineering units and conversion factors. Fundamentals, principles, and applications of precision measurement. Laboratory exercises and demonstrations using engineering systems. 1 lecture, 1 laboratory.

IE 132, 133  Systems and Procedures (2) (2)
Fundamentals and analytical concepts of office systems and procedures. Industrial engineering techniques applied to the formulation of work systems; forms control, filing, working environment, office location, and layout. Principles of organization and administration of production control in records management. 1 lecture, 1 laboratory.

IE 141  Shop Processes (1)
Principles, practices and theory of metal casting, sand and shell molding; precision investment casting; die casting; plastic forming and molding. Basic fundamentals and theory of pattern making and hot forming by forging methods. 1 laboratory.

IE 203  Materials Handling (2)
Organization for materials handling analysis; principles of materials handling; study of the principal types of handling equipment; methods of selection of equipment. 2 lectures. Prerequisite: IE 133

IE 204  Industrial Safety (2)
History of industrial safety; fire prevention; personal protective equipment; health hazards; machinery safeguards; electrical hazards; plant inspection; accident insurance. 2 lectures.

IE 221, 222, 223  Manufacturing Processes (2) (2) (2)
A study of the manufacturing processes in industrial operations. Fundamental principles and application concepts of equipment and special tools used in mass production. Methods and equipment applications for machine-tool, punch-press, forging, casting, welding, plastics and powder metallurgy operations. Finishing processes consisting of heat treatment, surface conditioning including plating, degreasing and organic finishing materials. 1 lecture, 1 laboratory. Prerequisite: MS 148, ME 143

IE 231  Production Tooling and Design (2)
Theory and fundamentals of metal cutting including selection and use of cutting tools. Principles and applications of tooling for production including basic design considerations. 1 lecture, 1 laboratory. Prerequisite: MS 148, ME 143

IE 232  Industrial Inspection (2)
Fundamental theory of inspection including inspection tools, techniques and methods. Dimensional control concepts and methods of non-precision instruments and precision tools and instruments. Testing for physical and mechanical properties and superficial inspection methods. Organization and management of inspection functions. 1 lecture, 1 laboratory. Prerequisite: IE 231

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 250 Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201

IE 321 Motion and Time Study (2)
A study of motion and time study as a management tool. Principles of motion economy; work simplification; micromotion analysis; theory and practice of time study; performance rating, and allowances; standard data. 1 lecture, 1 laboratory. Prerequisite: IE 223

IE 322 Manufacturing Planning: Process Planning (3)
Research and product development; process and product analysis; operation process charts; equipment, material, and personnel requirements; standardization and diversification; cost control; plant location. 2 lectures, 1 laboratory. Prerequisite: IE 231, 321

IE 323 Manufacturing Planning: Plant Layout (3)
Theory, principles, and techniques for effective plant layout; location and layout of production departments, service facilities, and offices; plot plan development. 2 lectures, 1 laboratory. Prerequisite: IE 322

IE 331 Motion and Time Study (3)
Principles, tools, and techniques for methods improvement and the setting of time standards. Motion and time study as used by management for planning and control. A study of methods for systems analysis. 3 lectures. For Non-IE Students. Prerequisite: Junior Standing.

IE 334 Production Control (3)
The role of production control in the industrial enterprise. Forecasting, estimating, purchasing, inventory procedures, and their relationship to production control. Routing, scheduling, and dispatching. A review of typical production control systems in job shop and continuous industries. Laboratory consists of work on typical production control problems in all related phases. 2 lectures, 1 laboratory. Prerequisite: IE 223. Concurrent: IE 321

IE 335 Production Programming (2)
The use of programming in industrial problems with particular reference to production control. Review of the fundamentals and basic types of programming such as the Distribution Method, the modified Distribution Method, several approximation methods and the Simplex Method. 2 lectures. Prerequisite: IE 334, Math 203

IE 336 Statistical Quality Control (3)
Theory and practice of statistical quality control as applied to industrial situations; control charts, acceptance sampling. 2 lectures, 1 laboratory. Prerequisite: Math 321

IE 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

IE 401 Sales Engineering (2)
Concepts and principles of sales in engineering, stressing service responsibilities related to the career of sales engineering. Indoctrination in qualities and attitudes essential to industrial engineering as well as sales engineering. Job qualifications, prime requisite factors, systems of distribution, the sales organization including its management and control, and fundamentals of salesmanship. 2 lectures. Prerequisite: Senior standing in engineering.
IE 411, 412 Organization for Manufacturing (2) (2)

Principles and techniques of administration and organization of the activities of an industrial enterprise. Planning, organization, staffing, direction and control functions in activities of: facilities, manufacturing processes, plant location, job evaluation and wage incentives, inventory control, production control, procurement, and sales. 2 lectures. Prerequisite: For non-IE students of Senior or advanced Junior standing in engineering.

IE 413 Management for Engineers (2)

Principles of management involved in the administration of the organizational functions of an industrial enterprise. The principles will be concerned with the basic fundamentals of management, including development of management concepts and techniques involved in the various aspects of administrative action. 2 lectures. Prerequisite: For non-IE students of Senior or advanced Junior standing in engineering.

IE 414 Engineering Economy (3)

Categories of engineering decisions. Interest rates in the industrial complex. Basic principles and tools of analysis. Application to industrial engineering through the use of case studies. 3 lectures. Prerequisite: Senior standing.

IE 421 Manufacturing Management (4)

Designed to coordinate the students' previous work in the several specialized areas within the general field of industrial engineering. A study, from a design concept, of systems of wage payment. Sociological and psychological aspects are considered. 3 lectures, 1 laboratory. Prerequisite: IE 323

IE 422 Manufacturing Management (3)

Theory of organization and management. Emphasis on the development of the concepts of the principles of management, their correct understanding and appropriate application in the various aspects of administrative action. Decision making, and human behavior in organizations. 3 lectures. Prerequisite: IE 421

IE 425 Industrial Procurement (2)

A study of procurement organization, policies, and procedures in industry and government. Description of quality; optimum quantity and price; selecting sources of supply; vendor relations; forward buying and speculation; procurement of major equipment, new and used; make or buy; procurement budgets. 2 lectures. Prerequisite: Senior standing.

IE 432 Industrial Data Processing (2)

Basic concepts and techniques of data processing for industrial operations. Emphasis on conceptual understanding of management's dynamic control opportunities with data processing. Study of the basic construction and theory of a digital computer. Application of various programming techniques using a digital computer as a basis for study. 2 lectures. Prerequisite: IE 421

IE 433 Numerical Control Machining (2)

Theory and applications of numerical control as applied to machine tools in manufacturing operations. Principles and application techniques of various control media. Engineering considerations for manufacturing "know-how", the programming function consisting of part geometry conversion to ordinate drawing and computer manuscript. Emphasis on continuous path numerical control machine tool operation as applied to two dimensional and three dimensional parts. 1 lecture, 1 laboratory. Prerequisite: Senior standing in IE.

IE 434 Advanced Motion and Time Study (2)

Elemental time data; basic motion-time systems; statistical time standards; work sampling; motion and time study training programs. 1 lecture, 1 laboratory. Prerequisite: IE 321
IE 441, 442, 443  Supervision Fundamentals (1) (1) (1)

Practical applications of elements of supervision. Laboratory conditions will be utilized to assist in providing situational cases for practice in applying the fundamental concepts and techniques of supervision. 1 laboratory. Prerequisite: Senior standing in IE.

IE 461, 462  Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

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.
Instruction in machine shop practice has two objectives: (1) to give the student a foundation in the basic skills and (2) to give an understanding of the part machine tools play in present day engineering and manufacturing enterprises. It is the intent of the Machine Shop Department to give the student a knowledge which will further his progress in the engineering fields. Operations, tools, and materials of the trade as well as shop safety are stressed in all departmental offerings.

The machine shop is unusually well-equipped with the latest machine tools and heat-treating equipment such as might be found in the best commercial toolroom. The shop is also equipped with all the necessary tools, attachments, and precision instruments for the construction of dies, tools, jigs, and fixtures such as are found in modern industry today.

### DESCRIPTIONS OF COURSES IN MACHINE SHOP

**MS 141 Shop Processes (1)**
- Basic lathe operation including turning and boring, external thread cutting and lathe tool grinding. 1 laboratory.

**MS 142 Shop Processes (1)**
- Basic milling machine operation including precision setups and indexing, and machine sawing and filing. 1 laboratory.

**MS 151 Machine Shop (1)**
- Fundamentals of basic layout methods, bench and drill press operations, use of hand tools, tool grinding, and metal properties. 1 laboratory.

**MS 152 Machine Shop (1)**
- Fundamentals of precise measurement and layout, metal properties, and drilling operations. 1 laboratory.

**MS 153 Machine Shop (1)**
- Advanced lathe operation including taper turning, internal thread cutting, precision boring, and other chucking operations. Tool grinding. 1 laboratory. Prerequisite: MS 141

**MS 154 Machine Shop (1)**
- Advanced milling machine operations including contoured and angular surfacing, rack cutting, and rotary table work. 1 laboratory. Prerequisite: MS 142

**MS 155 Machine Shop (1)**
- Fundamentals of grinding machine operation including cylindrical, surface, and tool grinding. 1 laboratory. Prerequisite: MS 153, MS 154

**MS 240 Machine Shop (1-2)**
- Advanced individual instruction on all machine tools. Construction and repair of laboratory equipment. Total credit limited to four units. 1 or 2 laboratories. Prerequisite: MS 153, MS 154

**MS 331, 332, 333 Tool Engineering (3) (3) (3)**
- Construction of production tools including jigs, fixtures, punch press tools, plastic molds, diecasting dies, and inspection devices. Field trips to manufacturing centers. 1 lecture, 2 laboratories. Prerequisite: MS 153, MS 155

**MS 421, 422, 423 Tool Design (3) (3) (3)**
- Design of manufacturing tools such as jigs, fixtures, and dies. Materials, tolerance balancing, and toolroom methods as design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Prerequisite: ME 203 or Aero 206
Mechanical engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of rigid, fluid, and thermal mechanics in the design and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering test, supervision of manufacture and erection.

The curriculum gives the student a thorough founding in mechanical design and a choice of courses such as machine design, turbomachinery, and piping design, available in his senior year, that will augment and strengthen his background for such design.

Laboratories are an important part of the student's education. He is enrolled in mechanical engineering laboratories from the beginning of his freshman year until his graduation. These laboratories include work in power generation, fuel study, fluid flow, heat transfer, vibration, and strength of materials.

There are two organized student clubs in the Mechanical Engineering Department: a student branch of the Society of Automotive Engineers and the Mechanical Engineering Society. These clubs offer students an active program of professional and social activity.

**CURRICULUM IN MECHANICAL ENGINEERING**

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<th>Course</th>
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<td>Mechanical Engineering Laboratory (ME 144, 145, 146)</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>* Shop Processes</td>
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<td>Engineering Drafting (ME 141, 142, 143)</td>
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<td>Elements of Electronics (EL 101, 102)</td>
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<td>Electronics Laboratory (EL 141, 142)</td>
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* AC 141, MS 141, MS 142, IE 141, Weld 141, Weld 142.
### Sophomore

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<td>Engineering Dynamics (Phys 202)</td>
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<td>Strength of Materials (ME 202, 203)</td>
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<td>Engineering Problems—Digital Computers (ME 250)</td>
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<td>Advanced Metal Joining Processes (Weld 251, 252)</td>
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<td>Mechanical Equipment of Buildings (ME 331)</td>
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<td>Introduction to Literature (Eng 207)</td>
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Senior

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*One of the following sequences must be included: Tool Design (MS 421, 422, 423), Fabrication Methods and Design (Weld 434, 435, 436), Design of Piping Systems (ME 424, 425), Machine Design (ME 401, 402), Heat Transfer, Nuclear Power Plants, Turbomachinery (ME 411, 412, 413).

†Industrial Relations (IR 312) may be substituted.

‡To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN MECHANICAL ENGINEERING

ME 131, 132  Mechanical Systems (3) (3)
Analysis and synthesis of mechanical systems and their components. Power, thermal, kinematic and process systems. 2 lectures, 1 two-hour laboratory.

ME 141  Engineering Drafting (2)
Basic principles and practices of isometric, oblique and multiview systems for technical drawing. Delineation of typical mechanical components and arrangements. Introduction to layout and design methods using multiview drawing. Section views. Drafting conventions. Techniques of dimensioning. 2 laboratories.

ME 142  Engineering Drafting (2)
Application of multiview projection system to typical layout and design problems involving points, lines, planes and geometric solids, including solids with simple curved surfaces. Basic principles of graphical methods for engineering computation and representation of engineering data. 2 laboratories. Prerequisite: ME 141 or 151

ME 143  Engineering Drafting (2)
Theory of selecting dimensions and tolerances for interchangeable parts and components of precise mechanical devices. Delineation and arrangements of detail and assembly working drawings. Application of welding, piping, and fastener symbols and representation to working drawings. Basic principles of architectural and structural drawing. 2 laboratories. Prerequisite: ME 141 or 151

ME 144, 145, 146  Mechanical Engineering Laboratory (1) (1) (1)
Basic experimentation and testing of mechanical equipment for the purpose of illustrating equipment function and instrumentation problems and limitations. This lab also provides the student descriptive information as background for his advanced mechanical engineering courses. 1 laboratory.

ME 151  Engineering Drafting (1)
Basic principles and practices of isometric, oblique and multiview systems for technical drawing. Delineation and arrangements of detail and assembly working drawings. Application of welding, piping, and fastener symbols and representation to working drawings. 1 laboratory. Prerequisite: ME 143 or 153

ME 152  Engineering Drafting (1)
Application of multiview projection system to typical layout and design problems involving points, lines, planes and geometric solids. 1 laboratory. Prerequisite: ME 141 or ME 151

ME 153  Engineering Drafting (1)
Delineation and arrangement of detail and assembly working drawings. Application of welding, piping, and fastener symbols and representation to working drawings. Basic principles of architectural and structural drawing. 1 laboratory. Prerequisite: ME 141 or ME 151

ME 202, 203  Strength of Materials (3) (3)
Relation between physical properties of materials and their use in engineering structures. Calculation of deflection and required size of basic structural and machine elements. 3 lectures. Prerequisite: Phys 201

ME 207  Simplified Drafting Methods (1)

ME 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.
ME 249 Strength of Materials Laboratory (1)
Commercial tests of materials. Familiarity with physical properties of industrially useful materials. Electric resistance strain gages. 1 laboratory. Prerequisite: ME 203

ME 250 Engineering Problems—Digital Computers (1)
Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: ME 203

ME 301, 302, 303 Thermo-Fluids (3) (3) (3)
First and second laws of thermodynamics, fluid statics and dynamics, incompressible and compressible flow, flow measurement, mixing concepts, combustion. 3 lectures. Prerequisite: Phys 202. Concurrent: Math 316

ME 304 Thermo-Heat Transfer (3)
Thermodynamic cycles, modern applications of these cycles. Introduction to heat transfer. 3 lectures. Prerequisite: Chem 321, ME 303

ME 308 Thermodynamics (3)
Systems, properties and measurements; work, heat and energy; first law of thermodynamics; second law of thermodynamics; gas laws; thermodynamic potentials. 3 lectures. Prerequisite: Phys 132

ME 309 Heat Transfer (3)
Introduction to heat transfer; momentum transfer (laminar and turbulent flow); heat transfer in laminar and turbulent flow; conduction; radiation. 3 lectures. Prerequisite: ME 308

ME 311 Fluid Flow (3)
Study of the principles that underlie the flow of various fluids. Fluid statics, viscosity, dynamic similarity, and fluid friction. Dimensional analysis, Reynolds number, steady flow energy transformation of compressible and incompressible fluids. Fluid resistance, dynamic lift and propeller action, propulsion theory, compressible flow. Pumps, turbine, fluid power transmission systems, and fluid film lubrication. 3 lectures. Prerequisite: Phys 202

ME 313 Fluid Mechanics (3)
Incompressible network flow, flow in open channels, flow around submerged objects, compressible flow, similitude, and fluid machinery. Prerequisite: ME 302

ME 314 Engineering Materials (3)

ME 324 Kinematics (4)
The study of motion in machine parts. Displacements, velocities, and accelerations in linkage, cams, gears, and other mechanisms. 3 lectures, 1 laboratory. Prerequisite: Phys 131, ME 142

ME 331 Mechanical Equipment of Buildings (3)
Application of engineering analysis and building code requirements in the design of building systems for handling water supplies, liquid wastes, fuel, gas and ventilation. Related systems connecting groups of buildings and health and accident hazards involved. 2 lectures, 1 laboratory. Prerequisite: Phys 132

ME 333 Plumbing and Building Sanitation (3)
For architectural engineering students. Calculation of water supply and consumption. Fire protection and sprinkler systems. Plumbing and drainage. Gas services. Application of principles to specific elements of engineering structures. 3 lectures
ME 343 Thermodynamics Laboratory (1)
Testing thermodynamic equipment and machinery. An advanced laboratory course requiring the student to determine the test procedure and instrumentation and to evaluate the degree of exactness or uncertainty of the test setup. 1 laboratory. Prerequisite: ME 302

ME 345 Fluids Laboratory (1)
Experimental determination of operating characteristics and performance criteria for industrial flow equipment, including pumps, pipes, measuring devices and others. 1 laboratory. Prerequisite: ME 301

ME 349 Advanced Materials Testing Laboratory (1)
Advanced laboratory work in testing of materials and structures. Column and beam tests, fatigue tests, static and dynamic experimental stress analysis techniques with electric resistance strain gages and brittle lacquer coatings. 1 laboratory. Prerequisite: ME 249

ME 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group study. Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

ME 401, 402 Machine Design (4) (4)

ME 406 Contracts and Specifications (1)
A study of the legal requirements of contracts, the technical and legal requirements of specifications, the legal relationships of the technical man. 1 lecture. Prerequisite: Junior standing.

ME 411 Heat Transfer (3)
Basic principles of heat transfer. Steady state and transient conduction problems using analytical and numerical methods. Free and forced convection. Transfer of radiant energy. 3 lectures. Prerequisite: Math 317, ME 302

ME 412 Nuclear Power Plants (3)
Engineering applications of nuclear energy, nuclear reactor design and operation, instrumentation and control. Nuclear power plants; materials, equipment and economics. 3 lectures. Prerequisite: Chem 322

ME 413 Turbomachinery (3)

ME 416 Mechanical Vibrations (4)

ME 422 Instruments and Controls (3)
Fundamentals of control system design and a study of basic electro-mechanical sensing elements used in control systems. Computation and study of various basic instruments used in control work. 2 lectures, 1 laboratory. Prerequisite: EE 208, Math 316
ME 423 Elements of Machine Design (4)

Fundamentals of machine design for engineering students other than mechanical. Stresses and deflections in machine parts. Engineering materials. Design of springs, bearings, gears, chains, belts, clutches and brakes. Course is oriented to stress philosophy of design, application and comparative advantage rather than basic design. 3 lectures, 1 laboratory. Prerequisite: ME 203, or equivalent, Math 203, Phys 202

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: ME 203, 302

ME 427, 428 Mechanical Design (3) (3)

Design of machine parts as determined by stress and deflection. Effect of varying stresses and stress concentrations. Design of shafts, springs, cranks, axles, and other machine parts. Bearings and lubrication. Mechanical and hydraulic power transmission. Balancing of rotating parts. Over-all design of machine assemblies. 2 lectures, 1 laboratory. Prerequisite: ME 203, ME 324, WM 306

ME 429 Mechanical Design (3)

Design of mechanical systems and components utilizing all disciplines of mechanical engineering such as stress analysis, materials engineering, thermodynamics, heat transfer, etc. 1 lecture, 2 laboratories. Prerequisite: ME 428

ME 434 Fundamentals of Petroleum Production (2)

Survey of the production of crude petroleum covering exploration, drilling, pumping, transportation, and storage. Observation of actual field operations and installations of major oil companies and oil equipment companies. Nomenclature, methods, and mechanical equipment. 2 lectures. Prerequisite: ME 146, 302

ME 435 Petroleum Production Development (3)

Mechanical engineering aspects of rotary drilling. Problems attendant to the rotary rig and its auxiliary equipment. Practical problems dealing with drilling mud, casing, cementing, directional drilling, and well completion operations. 2 lectures, 1 laboratory. Prerequisite: ME 203

ME 451 Advanced Graphical and Numerical Methods (1)


ME 461, 462 Senior Project (2) (2)

Selection and completion of a project under a minimum of 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 his chosen field. 2 meetings. Prerequisite: Senior standing.
The Welding and Metallurgical Engineering Department prepares students for employment as metallurgical engineers, and also provides service courses in welding and metallurgy to students in other departments of the college.

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 curriculum offers opportunity to pursue specialized metallurgical areas on an elective basis in the senior year.

The Welding and Metallurgical Engineering Department is well equipped with various laboratories and shops. The welding shop facilities include general arc and oxyacetylene equipment, as well as production prototypes for the automatic and inert-gas shielded welding processes.

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, and a physical testing laboratory.

The department sponsors a combined student chapter of two national societies, the American Welding Society and the American Society for Metals. The chapter offers an active program of professional and social activity.

**CURRICULUM IN METALLURGICAL ENGINEERING**

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<th>Freshman</th>
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<td>Properties of Materials (WM 121, 122, 123)</td>
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<td>* Shop Processes</td>
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<td>Elements of Electronics (EL 101, 102)</td>
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<td>Electronics Laboratory (EL 141, 142)</td>
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16½ 18½ 18½

* Shop Processes AC 141, MS 141, MS 142, IE 141, Weld 141, Weld 142.
Sophomore

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<td>Physical Metallurgy (WM 221, 222, 223)</td>
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<td>Engineering Problems—Digital Computers (WM 250)</td>
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<td>Engineering Statics (Phys 201)</td>
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<td>General Chemistry (Chem 322, 323)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Sports Education (PE 241)</td>
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| Total Sophomore Credit Hours          | 18½ | 18½ | 17½ |

Junior

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<td>Metallography and Heat Treatment (WM 321, 322)</td>
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<td>Fabrication Metallurgy (WM 324, 325, 326)</td>
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<td>Electrical Engineering (EE 207, 208)</td>
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<td>Electronic Engineering (EL 321)</td>
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<td>Electronic Engineering Laboratory (EL 354)</td>
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<td>Strength of Materials (ME 202, 203)</td>
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<td>Quantitative Analysis (Chem 331)</td>
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<td>American Government (Pol Sc 301)</td>
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| **Literature or Philosophy**           |   |   | 3 |

| Total Junior Credit Hours             | 18 | 17 | 16 |

Senior

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<td>Materials for Special Environments (WM 431)</td>
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<td>Senior Project (WM 461, 462)</td>
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<td>Undergraduate Seminar (WM 463)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>U. S. in World Affairs (Hist 305)</td>
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<td>General Psychology (Psy 202)</td>
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<td>‡Industrial Relations (IR 312)</td>
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</table>

| Total Senior Credit Hours             | 17 | 17 | 17 |

**DESCRIPTIONS OF COURSES IN WELDING**

Weld 141 **Shop Processes (1)**

Fundamentals of the gas and resistance welding metal joining processes. Selection and application of joining methods and materials. 1 laboratory.

Weld 142 **Shop Processes (1)**

Fundamentals of electric welding, joint design, cost and codes. Selection and application of the various electric welding processes. 1 laboratory.

Weld 155 **Fundamentals of Metallic Arc Welding (1)**

Shielded metallic arc welding including vertical position. Lecture on expansion, contraction, distortion, and residual stresses as applied to welded structures. Various joint types including lap, fillets, and butt joints. 1 laboratory. Prerequisite: Weld 148

* One of the following sequences must be completed:
  - Application Metallurgy Laboratory (WM 424, 425, 426).
  - Welding Engineering (WM 434, 435, 436).

** To be selected from the General Education list.

‡ Industrial Management (IR 311) may be substituted.
Weld 156  Fundamentals of Metallic Arc Welding (1)

Shielded metallic arc welding of heavy steel plates. Includes butt weld types, uses of backing materials, hard facing, cast iron, and overhead fillets. Basic weld tests. Arc welding of light-gauge steel sheets. 1 laboratory. Prerequisite: Weld 155

Weld 251, 252  Advanced Metal Joining Processes (1) (1)

High speed automatic and semi-automatic production processes for joining ferrous and non-ferrous metals and alloys. Procedure tests and qualifications in accordance with governing codes. Fundamentals of nondestructive testing. Basic cost estimating. 1 laboratory. Prerequisite: Weld 148

Weld 254  Advanced Welding (1)

Types and uses of various welding machines, their operating costs. The use of structural steel shapes for building machinery and farm equipment. Welding symbols, strength of welded joints, and basic cost estimating problems. 1 laboratory. Prerequisite: Weld 148

Weld 341  Special Problems in Welding by Arrangement (1-3)

Fundamentals of welding metallurgy, weldability of steels, steels and alloys for welded construction. Codes for construction of welded unfired pressure vessels. Design of pressure vessels according to the code used. 1, 2, or 3 laboratories. Prerequisite: Weld 148

Weld 359  Advanced Welding (1)

The application of the inert-gas shielded arc welding process to the hard-to-weld metals, including aluminum and stainless steel. Argon and helium as gas shields. 1 laboratory. Prerequisite: Weld 147, 148

Weld 434  Fabrication Methods and Design (3)

Weldability of steels and alloys and the metallurgical aspects of welded fabrication. 1 lecture, 2 laboratories. Prerequisite: WM 306

Weld 435  Fabrication Methods and Design (3)

Pressure vessel design and other design problems in accordance with governing codes. Cost estimating of steel fabrication. Jig and fixture design for mass production with the various welding processes. 1 lecture, 2 laboratories. Prerequisite: Weld 434

Weld 436  Fabrication Methods and Design (3)

Problems in inspection and quality control methods. Process selection for high speed production. Process procedure qualification. 1 lecture, 2 laboratories. Prerequisite: Weld 435

DESCRIPTIONS OF COURSES IN WELDING AND METALLURGY

WM 121, 122, 123  Properties of Materials (2) (2) (2)

Nature and identification of metals, metal joining and working processes. Selection of metals and joining processes for engineering uses. Elementary metallography. 1 lecture, 1 laboratory.

WM 221, 222, 223  Physical Metallurgy (4) (4) (4)

Principles of physical metallurgy. The iron carbon system. The structure of metals. Relation of engineering materials structures to physical properties. 3 lectures, 1 laboratory.

WM 240  Additional Metallurgy Laboratory (1-2)

Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

WM 250  Engineering Problems—Digital Computers (1)

Solution of selected engineering problems by means of digital computers. 1 laboratory. Prerequisite: Math 201
WM 301, 302, 303  Theory of Materials (3) (3) (3)
Fundamentals of corrosion and corrosion protective finishes. Study and interpretation of equilibrium diagrams. Metals in equilibrium and non-equilibrium conditions. Conditions of plastic deformation. Fatigue and creep problems. Application of metals to high temperature conditions. 3 lectures.

WM 306  Metallurgy for Engineers (3)
Properties, engineering applications, and constitutional phase diagrams and relation of structure to properties of cast iron, steel, stainless steels, non-ferrous metals. Alloys for high temperature service. Heat treatment of steels and aluminum and principles of welding metallurgy. For all engineering majors except metallurgical engineering. 3 lectures. Prerequisite: Weld 148, Chem 321

WM 321, 322  Metallography and Heat Treatment (1) (1)
Microscopic studies of metal structures as related to heat treatment and mechanical working. Ferrous and non-ferrous metal heat treating processes. 1 laboratory. Prerequisite: WM 223, Chem 321

WM 324, 325, 326  Fabrication Metallurgy (3) (3) (3)
Weldability of ferrous and non-ferrous metals and alloys. Theory and application of castings to metal product manufacturing. Rolling, forging, and extruding of metals. Elements of powder metallurgy. Testing and inspection methods, destructive and non-destructive. 2 lectures, 1 laboratory. Prerequisite: WM 223

WM 400  Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

WM 421, 422, 423  Advanced Materials (2) (2) (2)
Concepts and problems in the application of engineering materials. Analysis of the behavior of materials under various loading conditions. 1 lecture, 1 laboratory.

WM 424, 425, 426  Application Metallurgy Laboratory (4) (4) (4)
Problems and investigations in metal applications to products. Quality control methods in casting, forging, and forming. Codes and specifications. Advanced work in metallography and photomicrography. Metals for nuclear power. 2 lectures, 2 laboratories. Prerequisite: WM 322

WM 427  Problems in Electrical Welding Machines and Circuits (2)
Basic electrical problems in the design and application of welding transformers and rectifiers. Automatic welding equipment. Design of electronic control circuits for automatic welding machines. 1 lecture, 1 laboratory. Prerequisite: EL 321, EL 354

WM 431  Materials for Special Environments (2)
The metallurgical constitution and physical behavior of heat and corrosion resisting steels. Effect of radiation on metals and materials. The super-alloys and ceramic coatings of metals. 1 lecture, 1 laboratory. Prerequisite: WM 326

WM 434, 435, 436  Welding Engineering (4) (4) (4)
Welding design according to governing codes. Fabrication cost estimating. Jigs and fixture design for mass production. Inspection and testing. Welding production processes. Problems in weldability of steels and alloys. 2 lectures, 2 laboratories. Prerequisite: WM 326

WM 461, 462  Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

WM 463  Undergraduate Seminar (2)
Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments. 2 lectures. Prerequisite: Senior standing.
THE APPLIED ARTS DIVISION
Child Care Laboratory in Home Economics Building

Technical Arts Students Study Compressor in Construction Equipment Course

At the Technical Journalism Copy Desk
THE APPLIED ARTS DIVISION

The Applied Arts Division has four principal functions: it provides for its own major curricula, it prepares teachers who are seeking teaching credentials, it provides courses supplemental to the major and courses required as general education in all curricula, and it is a service division providing for students in agriculture, applied arts, applied sciences, and engineering courses related to and directly supporting the area of the major.

A supplementary function is to administer the activities of the Audio-Visual Department which provides services and production functions for the entire College.

The curricula included in the Applied Arts Division are: Business Administration, English, Home Economics, Physical Education, Printing Engineering and Management, Technical Arts, and Technical Journalism. The Music Department although not offering a major provides services for the entire student body.
The business administration program prepares students for employment in the administrative and technical functions of business, labor unions, and government agencies. Specialized course work is designed to shorten the essential period of apprenticeship all administrators must serve. Correlated theory and practice are provided early in the program so the student will know the why and how of business operations.

The program provides courses in general education together with a core of basic business courses upon which to build a concentration in a specialized field of business. The opportunities afforded the student in the business administration program are unique in that the offerings of the Agriculture, Engineering, Applied Sciences and Applied Arts Divisions are strongly recommended to the student. The course work in these fields, together with the foundations provided by the courses in business and the broad general education background, will give training which will assist the student to go directly into the field of business in which he is best qualified.

**CURRICULAR CONCENTRATIONS**

**Accounting**

The accounting concentration provides training and practice for both public and private accounting areas.

**General Business**

This concentration is broad in nature and emphasizes managerial functions. Further specialization is obtained in the areas of business management, small business management and general business.

**Industrial Relations**

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

**Marketing**

The program within this concentration relates to product management as well as the marketing aspects of the business.

In addition, a minor in Business Administration is available for students who wish to take business as a part of their teaching credential requirements.
# Applied Arts Division

## CURRICULUM IN BUSINESS

### Freshman *

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<td>Public Speaking (Sp 201)</td>
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<td>Physical Education (PE 141)</td>
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<td>** Natural Sciences **</td>
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<td>Mathematics of Business (Math 108, 109)</td>
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<td>The Business Enterprise (Bus 101)</td>
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### Sophomore

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<td>** Natural Sciences **</td>
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<tr>
<td>Mathematics for Business Decisions (Math 207)</td>
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<tr>
<td>Descriptive Statistics (Math 211)</td>
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<td>Statistical Methods (Math 212)</td>
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<tr>
<td>Principles of Economics (Ec 201, 202, 203)</td>
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<tr>
<td>Principles of Accounting (Actg 221, 222)</td>
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<tr>
<td>Cost Accounting and Analysis (Actg 223)</td>
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<tr>
<td>Business and Its Environment (Bus 202)</td>
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<tr>
<td>Marketing Principles (MSM 204)</td>
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<th>Total</th>
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### Junior

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<th>Course</th>
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<tr>
<td>** Literature, Art or Music **</td>
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<tr>
<td>Ethics (Phil 204)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<tr>
<td>Political and Economic Geography (Geog 315)</td>
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<tr>
<td>American Government (Pol Sc 301)</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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<tr>
<td>U. S. in World Affairs (Hist 305)</td>
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<td>3</td>
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<tr>
<td>Business Law (Bus 301, 302, 303)</td>
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<tr>
<td>Money, Credit and Banking (Bus 407)</td>
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<tr>
<td>Financial Management (Bus 408, 409)</td>
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<tr>
<td>Machine Techniques in Business (Bus 351)</td>
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<tr>
<td>** Electives and courses to complete Major **</td>
<td>3</td>
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</tbody>
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| Total                                                           | 18 | 17 | 15 |

* Unless already acceptable typists, majors will be required to take Bus 140 and/or Bus 141 during their freshman year.

** To be selected from the General Education list.

*** 27 of the elective units in the junior and senior years must be chosen with the approval of the adviser in a field of concentration.
California State Polytechnic College

Senior

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Social Sciences Elective</td>
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<tr>
<td>Business Policies (Bus 413)</td>
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<td>Business Organization (Bus 414)</td>
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<tr>
<td>Business Labor Relations (Bus 415)</td>
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<td>Senior Project (Bus 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Bus 463)</td>
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<tr>
<td>Restricted Electives</td>
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<tr>
<td>Electives and courses to complete Major</td>
<td>2</td>
<td>6</td>
<td>5</td>
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</table>

*** 27 of the elective units in the junior and senior years must be chosen with the approval of the adviser in a field of concentration.

DESCRIPTIONS OF COURSES IN 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. 2 lectures, 1 two-hour laboratory.

Actg 221, 222 Principles of Accounting (4) (4)
Principles and practices of fundamental accounting theory. 3 lectures, 1 two-hour laboratory.

Actg 223 Cost Accounting and Analysis (4)
Accounting for cost control applicable to production, distribution, and service enterprises. Analysis and interpretation of financial statements. 2 lectures, 2 two-hour laboratories. Prerequisite: Actg 132 or 222

Actg 304, 305 Tax Accounting (3) (3)
Analysis of the federal and state tax laws and their application to taxpayers. Estate and other succession taxation, gift taxation, and income taxation of fiduciaries. 2 lectures, 1 two-hour laboratory. Prerequisite: Actg 222

Actg 321, 322, 323 Advanced Accounting (4) (4) (4)
Advanced accounting theory and practice including consolidated financial statements. Problems of valuation and income determination relating especially to cash, accounts receivable, inventories, and installment sales. 3 lectures, 1 two-hour laboratory. Prerequisite: Actg 222

Actg 331 Accounting Systems (3)
Installation and operation of accounting systems in business with special attention to internal control. Application of the latest techniques in the use of modern methods of handling numbers with special reference to accounting and statistical methods. 2 lectures, 1 two-hour laboratory. Prerequisite: Actg 223

Actg 346, 347 Auditing (3) (3)
Principles and procedures of the verification of accounts and the preparation of working papers and the completed audit report. 2 lectures, 1 two-hour laboratory. Prerequisite: Actg 323 or consent of instructor.

Actg 452 CPA Problems (3)
Intensive study of advanced accounting problems. Emphasis on problems of the type found in the C.P.A. examinations. Designed for those wishing to prepare for the C.P.A. examination, and for those planning to enter the field of private business accounting. 1 lecture, 2 two-hour laboratories. Prerequisite: Actg 323
DESCRIPTIONS OF COURSES IN BUSINESS

**Bus 101 The Business Enterprise (4)**
A study of American business enterprise and its component parts including an appreciation of the scope and problems inherent therein. Familiarization with the business administration program and the opportunities in the business field. 4 lectures.

**Bus 103 Business Reports (3)**
Organization and presentation of different types of business reports. 3 lectures.

**Bus 104 Office Organization and Operation (3)**
Basic office procedures and practices. Knowledge and techniques necessary to work in or manage a business office. 3 lectures.

**Bus 140, 141, 142 Typing (1) (1) (1)**
Designed to teach the fundamentals of the touch system in the shortest time. Training in making out business forms and writing business letters. 3 one-hour periods.

**Bus 202 Business and Its Environment (3)**
A course designed to give students an appreciation of the business unit and its relation to social, economic, political and cultural institutions. 3 lectures. Prerequisite: Ec 201

**Bus 206 Purchasing (3)**
The purchasing function as it applies primarily to manufacturers, utilities and institutions. Representative cases in each major area are studied and emphasis is given to the function of the purchasing department of the company in relation to and in cooperation with other major divisions of the enterprise. 3 lectures.

**Bus 301 Business Law (3)**
American law sources, courts, contracts, agency and business torts. 3 lectures. Prerequisite: Junior standing.

**Bus 302 Business Law (3)**
Legal organization creation, site acquisition, credit devices, negotiable instruments, bailments, and sales. 3 lectures. Prerequisite: Bus 301

**Bus 303 Business Law (3)**
Business insurance, competitive cooperation, taxation incidents, patents, copyrights, trademarks, trade names, insolvency, and business terminations. 3 lectures. Prerequisite: Bus 302

**Bus 306 General Business Administration (3)**
Forms and structures of business enterprises. Techniques of office organization and administration. Business and personnel relationships with emphasis on commerce and agriculture. 3 lectures.

**Bus 310 Insurance Principles (3)**
Introduction to the basic principles of insurance from the viewpoint of the consumer. Risk and risk bearing; principles of insurance buying; major types of private insurance—life, property, liability—with emphasis on the underlying economic problems each type is designed to meet; the insurance contract and its legal basis. 3 lectures.

**Bus 311 Property and Casualty Insurance (3)**
A survey of property and casualty insurance. Analysis of insurance investments, policies, forms, endorsements and rate making. Fidelity and surety bonding and analysis of policies and rate making. 3 lectures. Prerequisite: Bus 310
Bus 312 Life and Health Insurance (3)
A study of life and health insurance. Analysis of contracts from the viewpoint of the insurance consumer, interpretation of major policy provisions, integration of private policies with social insurance coverages. 3 lectures. Prerequisite: Bus 310

Bus 321 Business Applications of Data Processing (3)
Applications of the latest techniques in the use of modern methods of handling numbers. Use of data processing in various phases of business operations. 2 lectures, 1 two-hour laboratory.

Bus 351 Machine Techniques in Business (2)
History and development of machine techniques in the functions of business. Experience in the use of basic business and accounting machines. Human and capital considerations. 1 lecture, 1 two-hour laboratory.

Bus 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation of special areas in the field of business. Total credit limited to four units with not more than two units in any one quarter. Prerequisite: Senior standing or consent of instructor.

Bus 401 Techniques for Teaching Business Subjects (3)
Organization and correlation of materials and techniques in business. Organization of course outlines, teaching units, and instruction sheets. 3 lectures.

Bus 406 Business Fluctuations and Forecasting (3)
Causes and techniques of forecasting business fluctuations. 3 lectures. Prerequisite: Bus 202, Math 212, Actg 222

Bus 407 Money, Banking and Credit (3)
Institutions and principles of money flow and money markets as they relate to the business enterprise. 3 lectures. Prerequisite: Ec 201

Bus 408, 409 Financial Management (3) (3)
Problems of financial planning, control and analysis as they relate to the management of resources, including internally and externally generated funds. 3 lectures. Prerequisite: Actg 222, Ec 203

Bus 412 Law of Real Property (3)
Legal theory and practice of estates in land. Also includes landlord and tenant relationships, land transactions, mortgages and trust deeds, easements, land use, ownership rights in land and public land law. 3 lectures. Prerequisite: Bus 301

Bus 413 Business Policies (3)
Internal and external problems of management at lower, middle, and upper levels. Analysis and decisions in setting policies for organization and operations to reach business objectives. Uses of capital, sources of capital, protection of capital and distribution of earnings. 3 lectures. Prerequisite: Senior standing.

Bus 414 Business Organization (3)
Fundamentals of management and the application of policies to organization and business operation. Emphasis on management’s responsibility and methods in analyzing, coordinating, motivating, and controlling all activities of the business organization to attain objectives. 3 lectures. Prerequisite: Bus 413

Bus 415 Business-Labor Relations (3)
The labor market. Economics of demand and supply for labor. The work week and labor from a business point of view. The changing field of labor law. 3 lectures. Prerequisite: Senior standing.

Bus 417 Quantitative Methods and Controls in Business (3)
Basic principles of methodology 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: Recommendation of adviser and senior standing.
Bus 418 Management, Unions, and the Public (3)

The relationships which exist among the areas of management, labor and unions, and the public. For the senior student who desires an intensive course in the management-labor area of industrial and business activity. 3 lectures. Prerequisite: Recommendation of adviser and senior standing.

Bus 419 Management Coordination (3)

An overview of the operations of an industrial organization; the inter-relationship of functions, and the fundamental principles of management that lead toward effective coordination and control. Development and understanding of line, line and staff, and functional organizational operations. Authority and responsibility, departmentation, and centralization and decentralization of management. 3 lectures. Prerequisite: Recommendation of adviser and senior standing.

Bus 461, 462 Senior Project (2) (2)

Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Formal report is required. Required minimum of 120 hours.

Bus 463 Undergraduate Seminar (2)

Study and discussion by students of recent development in the students' major fields. Prerequisite: Senior standing or special permission.

DESCRIPTIONS OF COURSES IN INDUSTRIAL RELATIONS

IR 111 The Labor Movement in California and United States (3)

Labor movement theories, American trade-union development, union management, labor and economic political power, variations in labor movements. 3 lectures.

IR 118 Human Relations (3)

The interest of business, industry and government in human relations; the development of that interest in terms of research and practice; the contributions to an emerging study of human relations by social scientists and practitioners; union relationship and executive leadership from a human relations point of view. 3 lectures.

IR 213 Personnel Administration (3)

Understanding the basic objectives, viewpoints, principles, and methods that distinguish personnel administration and personnel functions. 3 lectures.

IR 216 Wage and Salary Administration (3)

Functions of management that involve planning, developing, directing, and controlling all phases of employee compensation. Areas included are: job evaluation, employee evaluation, job standardization and work measurement, incentive wages and managerial compensation. 3 lectures.

IR 301 Trade Unionism in the United States (3)

Development of trade unions and their internal organization, the impact of collective bargaining on the labor markets, labor legislation, trade union contracts, collective bargaining, grievances and arbitration. 3 lectures. Prerequisite: Consent of instructor.

IR 311 Industrial Management (3)

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. 3 lectures.

IR 312 Industrial Relations (3)

Employer-employee relationships in the area of labor relations and personnel administration; the foreman, employee, and “human relations” in industry. Background of U.S. Labor movement; current labor legislation. The employment process job application techniques; personal adjustment to job situations. 3 lectures.
IR 315 Individual and Group Human Relations (3)
Individual and group practice in decision making using the case method. 3 lectures. Prerequisite: Recommendation of adviser and junior standing.

IR 316 Collective Bargaining (3)
Collective bargaining and the relationship between management and labor. The bargaining unit, recognition, the labor agreement, strikes, picketing, boycotts, unfair labor practices, and mediation and arbitration. 3 lectures.

IR 412 Labor Law (3)
Federal and state labor laws and their effects upon labor and management. 3 lectures. Prerequisite: Bus 301

IR 413 Contract Administration (3)
Designed to equip representatives of labor, management, and government agencies to cope with problems involving contracts between unions and companies. 3 lectures.

DESCRIPTION OF COURSES IN MARKETING

MSM 204 Marketing Principles (3)
A survey of the basic institutions and the functions they perform in the marketing process. Includes definition of industry and consumer markets, marketing research, physical distribution, promotion and advertising, buying and selling. 3 lectures.

MSM 205 Physical Distribution (3)
The physical movement of goods from manufacturer to ultimate consumer. Includes channels of distribution to industrial and consumer markets, warehousing, transportation, wholesale and retail operations. 3 lectures. Prerequisite: MSM 204 or consent of instructor.

MSM 206 Market-Sales Development (3)
Selling and sales promotion methods and techniques. Matching products with customers. Preparing sales presentations to buyers. Service sales techniques. 3 lectures.

MSM 304 Marketing Research (3)
Data-gathering principles and techniques used in study and analysis of markets, products, consumers, sales performance. 3 lectures. Prerequisite: MSM 204 or consent of instructor.

MSM 305 Promotion and Advertising (3)
The functional methods of reaching and cultivating industrial and consumer markets. Includes the oral, printed, and electronic media available to business; their characteristics, costs, and limitations. 3 lectures. Prerequisite: MSM 204 or consent of instructor.

MSM 405 Sales Management (3)
Management of sales personnel. Includes recruiting, training, organization, control, determination of and planning of sales policies and operations to business objectives. 3 lectures. Prerequisite: MSM 206 or consent of instructor.

MSM 406 Marketing Management (3)
Planning, organizing, operating, and controlling of the total marketing activities of the business in coordination with all other activities of the business. 3 lectures. Prerequisite: MSM 405 or consent of instructor.

MSM 407 Marketing Problems (3)
Marketing and sales problems. 3 lecture-discussions. Prerequisite: Consent of instructor.
The Education Department staff, in addition to teaching professional courses, advises fifth-year and graduate students who are working toward initial and advanced credentials. All undergraduate students preparing to teach in the elementary or secondary schools may earn a baccalaureate major in: Agriculture, Biological Science, Chemistry, English, Home Economics, Mathematics, Physical Education, Physics, Social Sciences, or Technical Arts (Industrial Arts). Credential candidates must also earn a minor which should be selected as early as possible. The details of the requirements are available from the major department, the minor department, or the Education Department.

The Education Department offers the Master's Degree in Education; professional courses in Elementary School Teaching, Secondary School Teaching, School Supervision (including elementary and secondary principalships), Pupil Personnel Services; and service courses in Art, Audio-Visual, and Psychology.

Special emphasis is placed on the preparation of persons to teach vocational subjects in the schools including advisement for the Bachelor of Vocational Education Degree. Instruction is also given in some administrative and supervisory phases of vocational education.

Instructors in many departments at California State Polytechnic College help students develop competence in the subject to be taught and the methods of teaching. Each candidate for teaching is prepared to be a professional staff member in a public school. An institutional approach to teacher education is strengthened through the use of teacher education committees composed of staff members in the major and the education departments who evaluate the progress and potentialities of each student. Good relationships with community and school personnel enable teaching candidates to engage in a variety of experiences needed to become successful instructors.

The Education Department provides coordination for the following teacher credential programs which are accredited by the State Board of Education.

- Standard Teaching Credential— Elementary Specialization
- Standard Teaching Credential— Secondary Specialization
- General Elementary Credential (Expires September, 1966)
- General Secondary Credential (Expires September, 1966)

**DESCRIPTIONS OF COURSES IN EDUCATION**

**Ed 300 School Observation (2)**

Preparation for observation of child behavior and teaching methods in the classroom; principles of child behavior; use of classroom equipment; techniques of observing; California public school child accounting system. 1 lecture, 1 observation period.

**Ed 301 Principles of Secondary Education (3)**

Introduction to the profession of secondary school teaching; analysis of teaching as a vocation; orientation in what is required of a good teacher; objectives, functions, and curricula of secondary schools. 3 lectures.

**Ed 302 Principles of Elementary Education (3)**

Brief history of elementary education; some philosophies of elementary education; aims and objectives of education for a democracy; elementary program in the California schools. 3 lectures.
Ed 304  Human Growth and Development (3)
Physical, social, emotional, and intellectual development during childhood and adolescence, with particular applications to the school situation. Problems of mental hygiene. 3 lectures.

Ed 305  Guidance Techniques for Teachers and Parents (3)
Counseling and guidance as an integral part of good education; parent-child relationships; teacher-child relationships; some diagnostic techniques; techniques of parent conference; the community and mental hygiene; community and state resources available to parents and teachers. 3 lectures. Prerequisite: Ed 304

Ed 312  Educational Psychology (3)
Pupil-teacher relationships; promotion of learning, mental health, and motivation. Individual differences and group interaction. Group methods and classroom observation. 3 lectures. Prerequisite: Psy 202

Ed 330  Survey of Elementary School Methods (5)
Introduction to techniques and procedures used in elementary school teaching; observation in elementary schools at all levels; methods of teaching basic elementary school subjects with emphasis on reading, language, arithmetic, science, and social studies; preparation for student teaching. 5 activity periods. Prerequisite: Ed 312

Ed 400  Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation. Total credit limited to four units, with not more than 2 units in any one quarter. 1 or 2 meetings. Prerequisite: Permission of the department head.

Ed 403  Secondary School Teaching Plans and Techniques (5)
Planning lessons, unit development, specific teaching skills, class management, and utilization of community resources and relationships. Demonstrations and observations in secondary schools. Classroom planning co-ordinated with public school practice. 5 lectures. Prerequisite: Ed 312

Ed 406  Evaluation in the Elementary School (3)
Appraising the results of instruction in terms of educational objectives. Pupil growth as a product of environment, health, attitudes, and mental ability. Value of cumulative records, reports to parents, and teacher-made tests as evaluation devices. 3 lectures. Prerequisite: Student teaching experience or approval of instructor.

Ed 415  Early Childhood Education (3)
Brief history of the kindergarten and nursery school program. Study of the needs, behavior and development of young children and how they affect readiness for learning. Techniques of parent-teacher conferences, and current trends in reporting pupil progress. Some observation in the public schools. 3 lectures.

Ed 417  The Junior College (3)
The purpose, history, organization and curriculum of the junior and community college. For persons teaching and planning to teach in the junior college. 3 lectures.

Ed 418  Principles of Adult Education (3)
Purposes, significance, scope and methods of teaching as applied to adult education. 3 lectures.

Ed 419  Administration of Vocational and Practical Arts Education (3)
A study of methods of inaugurating and administering programs of vocational and practical arts education including agriculture, business, diversified co-operative, distributive, homemaking, industrial arts, and trade and industrial education. 3 lectures.
Ed 430  Student Teaching (3-12)
Student teaching includes participation, teaching, and allied activities under the direction of a selected regular teacher in a public school in consultation with college supervisors. The application for student teaching must be approved prior to registration for Ed 430. A grade below C is unacceptable for recommendation for a credential.

Ed 433  Methods and Materials in Kindergarten-primary Education  (3)
A study of the activities and curriculum of the kindergarten-primary program, including teaching methods and materials. Considerable emphasis is given to the construction of materials used at the kindergarten-primary levels. 2 lectures, 1 activity period. Prerequisite: Ed 304, 312, 415

Ed 434  Elementary School Reading and Language Arts (6)
Methods and materials of teaching language arts, including reading, language, spelling, writing, speaking, and listening; includes the use of audiovisual aids and evaluation in these areas. 2 lectures, 1 activity period. Prerequisite: Ed 304 and 330

Ed 434A  Teaching Language Arts in the Elementary School (3)
Methods and materials for teaching language usage, spelling, dramatics, handwriting, listening and speaking. Includes instructional materials, audiovisual aids and evaluation. Prerequisite: Ed 304. 3 lectures.

Ed 434B  Teaching Reading in the Elementary School (3)
Teaching reading; reading readiness; psychology of learning to read; instructional materials; evaluating growth; developing independent reading skills; recreational reading. Prerequisite: Ed 304. 3 lectures.

Ed 435A  Teaching Social Studies in the Elementary School (3)
Emphasizes the nature of social growth of children in a democracy; methods and materials; unit planning; child development approach to content; use of audiovisual aids; evaluation. 3 lectures. Prerequisite: Ed 304

Ed 435C  Teaching Science in the Elementary School (3)
Methods of organizing the science program; teaching procedures; how to do experiments, make field trips, and prepare collections. Use of audiovisual aids. 3 lectures. Prerequisite: Courses in natural science.

Ed 461, 462  Senior Project (2) (2)
Selection and completion of a project in elementary education under a minimum of supervision. Projects typical of problems which graduates must solve as professional elementary teachers. Results presented in a formal report. Minimum 120 hours total time.

Ed 463  Undergraduate Seminar (2)
Study and discussion of recent and current developments in the field of elementary education; analysis of current literature in the field. 2 lecture-discussions.

Ed 478  Elementary Curriculum Construction (3)
Advanced approach to the problems of elementary curriculum development. Public relations; people involved in building the curriculum; implementing the purposes of education through the curriculum; child development and the curriculum. 3 lectures. Prerequisite: Ed 331

Ed 490  Workshop (Various titles as required) (1-6)
Special workshops organized either on the initiative of the college or at the request of special groups. Workshops so constituted will be given appropriate titles, descriptive of the particular activities involved.
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 Counseling and Guidance (3)
The philosophy, techniques, and administration of individual and group guidance programs. Individual counseling. The assessment of students' interests, abilities, and achievement with respect to educational and vocational choice, and school and life orientation. 3 lectures.

Ed 504 Evaluation in Secondary Education (3)
Preparation and use of tests; new objective tests; check lists and rating scales. Supplementary observational techniques. The use of all such devices in evaluation. Assigning grades and reporting results. 3 lectures.

Ed 507 Teacher-administrator Relationships (3)
Administrative problems associated with the operations of schools and school systems as they affect the teacher. Individual school, city, and state school systems, the Federal Government in education, and the California Education Code. Evaluation of administrative principles and practices. 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 510 School Finance and Business Management (3)
A consideration of the sources of public school support in California and the formulas by which funds are distributed to educational agencies. Budgets, audits, accounting, financial statements, salaries and retirement, purchasing and managing of plants, equipment, and supplies. 3 lectures. Prerequisite: Valid general credential.

Ed 511 School Law (3)
The legal problems affecting schools, using as sources the California Administrative Code, Title 5, the Education Code, the Attorney General's opinions, and interpretations of the state and federal courts. 3 lectures. Prerequisite: Valid general credential.

Ed 512 Secondary School Administration (3)
The three major phases of the work of the secondary administrator; his function as a leader of people, his duties as a director of education, and his techniques as an organizer and manager, including teacher-administrator relationships. 3 lectures. Prerequisite: Valid general credential.

Ed 513 Federal, State, County, and City School Administration (3)
Objectives of public school administration and an overview of all levels of organization; problems in state, county, and city school organization, particularly as related to California; federal government and education; issues involved in federal support. 3 lectures. Prerequisite: Valid general credential.

Ed 514 School Housing (3)
Designing school plants to serve educational purposes; procedures involved in planning school construction; selection and use of school sites; functions of architects, engineers, and contractors; financing school building programs; the law related to school housing; community participation in building programs; the services of the State Department of Education. 3 lectures. Prerequisite: Valid general credential.
Ed 515 Secondary School Curriculum (3)
Advanced study of problems in secondary curriculum development; social and psychological backgrounds; techniques in curriculum development; communication problems in curriculum work; group processes in curriculum development; evaluation of curriculum programs. 3 lectures. Prerequisite: Valid general credential.

Ed 516 Secondary School Supervision (3)
The administrative organization of supervision. City and county supervisory methods and procedures in secondary schools. Evaluation of present practices. In-service improvement of instruction through supervision. Group processes and communication problems in supervision work. 3 lectures. Prerequisite: Valid general credential.

Ed 517 School-Community Relationships (3)
The school and public relations. The administrator's relationship with community groups and organizations. Effect upon the public schools of community and patrons. Public administration as it affects the community's educational program. Operation of urban and rural schools, vocational education, education for adults, special school programs and auxiliary agencies. 3 lectures. Prerequisite: Valid general credential.

Ed 518 Problems in Teaching Reading (3)
For teachers and supervisors in elementary and secondary schools who need information on latest methods of diagnosing individual reading problems. Problems of individuals, classes and schools analyzed. Formulation of plans for improved reading instruction and total school programs based on research information. 3 lectures. Prerequisite: Graduate standing.

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. Prerequisite: Graduate standing.

Ed 531 Elementary School Supervision (3)
Principles and techniques of educational leadership in curriculum development. Curriculum improvement, working effectively with the staff, evaluation of instruction. Group processes and communication problems in supervision work. 3 lectures. Prerequisite: Valid general credential.

Ed 532 Elementary School Administration (3)
Principles and practices of organizing and administering the elementary school, including teacher and pupil personnel management, leadership techniques, instructional problems, special services, school plant, local school finances. Practical applications to elementary schools. 3 lectures. Prerequisite: Valid general credential.

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 Observation and Participation in Secondary Schools (5)
Observation and reporting in all subject matter areas; assisting advisers, the principal, attendance officer; various specific duties in the cafeteria, study hall and playground; assisting extra-class advisers with their activities; weekly discussion with co-ordinator of student teaching. Ed 540 taken currently with Ed 430, the two courses constituting a full load for the quarter.

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 546  Supervised Field Experience in Counseling  (3)
Practical application in the public schools or college counseling center of interview-
ing, counseling, test administration and interpretation, case conference tech-
niques, use of counseling records and other principles and procedures in counseling.
Besides field experience, weekly seminar sessions with college staff to be included.
Prerequisite: Psy 535

Ed 581  Graduate Seminar in Education  (3)
Group study of contemporary teaching problems. Trends, developments, individ-
ual problems. 3 lectures.

Ed 588  School Administration Field Work  (3-6)
Supervised field work in school administration or supervision at the elementary or sec-
ondary level; specific assignments made to cover important aspects of school admin-
istration or supervision. Prerequisite: Valid general credential.

Ed 590  Seminar in Supervision of Student Teachers  (3)
Organization, responsibilities, problems, and procedures in supervising, directing, and
evaluating student teachers and student teaching activities. 3 lecture-discussions.

Ed 591  Seminar in School Administration  (3)
Current problems in school administration; study of recent and current literature
bearing on administration; development of problem-solving techniques for adminis-
trators. 3 discussion meetings. Prerequisite: Valid general credential.

DESCRIPTIONS OF COURSES IN ART

Art 201  Art Fundamentals  (3)
Experience in drawing and shaping materials to achieve basic skills in delineation
and understanding of art structure. 3 activity periods.

Art 231  Art in Everyday Life  (3)
Principles of art as expressed in our contemporary culture. Evaluating community
planning, home design, industrial design, furnishing and decorating, and objects of
everyday use. The influence of art expression in developing and expressing the
personality of the individual. 3 lectures.

Art 232  Orientation to Art Materials  (3)
The contribution which art can make to the democratic way of life. Considera-
tion of the development of appreciative and creative skills. Emphasis on drawing
and graphic work. The development of units and procedures. Problems in develop-
ing creative skills in selecting, organizing, guiding, and evaluating individual and
group activities. 3 activity periods.

Art 233  Orientation to Crafts  (3)
Basic projects with various craft materials such as ceramics, metalwork, textile
design, woodwork, and leatherwork. Emphasis on design as presented through
materials and their properties. Lectures, discussion, demonstration projects, and
evaluative criteria applied to craft materials. 3 activity periods.

Art 238  Art in the Home  (3)
Principles of art applied to the home, its furnishings and to personal attire. Labora-
tory problems in the arrangement, selection and evaluation of useful and well
designed objects; study of line, color in relation to personal grooming. 2 lectures, 1
activity period.

Art 255  Art in Industry  (2)
Fundamental design problems common to all phases of industry and commerce.
Developing vocabulary and criteria for evaluation of specific items in terms of
design principles and current practice. 2 lectures.
Applied Arts Division

Art 321 Applied Color and Design (3)
Study of lines, planes, masses, textures, color, and aspects of space as elements in the structure of the plastic arts. Balance, rhythm, and proportion of any two or more of these elements as utilized in the fine and applied arts. Experience in simple media. 2 lectures, 1 activity period. Prerequisite: Art 231 or permission of instructor.

Art 324 Advanced Crafts (2)
Applied principles of general design and color theory in ceramics, metal work, textile design, and simple woodworking. Emphasis on skill development, material handling, and current methods of applied design. Lecture-discussion, investigation, laboratory projects. 1 lecture, 1 laboratory. Prerequisite: Art 233 or 321, or permission of the instructor.

Art 340, 341 Painting Techniques (2) (2)
Development of advanced skills in using art media. Concentration on oil, water color and mixed media. 2 laboratory periods. Prerequisite: Art 201 or permission of the instructor.

Art 420, 421 Art History (3) (3)
The chronological study of the significant art and artists in world history. In addition to painting and sculpture, considerable emphasis will be given to the applied arts of each period. 3 lectures.

Art 437 Art in the Schools (3)
Development of the creative artistic abilities of children; integration of art skills and appreciation in the total school curriculum. Use of audiovisual aids. 2 lectures, 1 activity. Prerequisite: Art 232 or permission of the instructor.

DESCRIPTORS OF COURSES IN AUDIOVISUAL EDUCATION

AV 329 Commercial Illustration (3)
Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing, layout, lettering for single and multiple color runs. Study of various approaches to registration; uses of color and texture in art copy. 1 lecture, 2 activity periods.

AV 400 Special Problems in Audiovisual Production (1-2)
Individual or group investigation. Total of credit limited to four units, with not more than two units in any quarter. 1 or 2 laboratories. Prerequisite: AV 431 or consent of instructor.

AV 431 Audiovisual Instruction: Methods and Materials (3)
Visual and auditory methods and materials of value in classroom teaching in elementary and secondary schools. Lecture, lecture-demonstration, discussion, previewing, and laboratory work. Planning and correlating use of audiovisual techniques in the classroom. 2 lectures, 1 laboratory. Prerequisite: Ed 312 or permission of the instructor.

AV 432 Audiovisual Methods in Agriculture and Engineering (3)
Industrial uses of visual and auditory materials in planning training aids, mass communication materials, demonstrations, mockups, models, and conference leading techniques. Planning, previewing, and skill development for business and industry. 2 lectures, 1 laboratory. Prerequisite: Psy 302 or permission of the instructor.

AV 433 Audiovisual Production Workshop (3)
Analysis of advanced problems of instruction, production of materials in relation to these problems, using audiovisual materials and methods. Skill development in problem-solving through contact with materials, equipment, and methods employed in audiovisual communication. 2 lectures, 1 laboratory. Prerequisite: AV 431 or 432, or permission of the instructor.
DESCRIPTIONS OF COURSES IN PSYCHOLOGY

Psy 1, 2 Reading Improvement (2) (2)
Improvement of basic reading skills. Training in quick, accurate visual and auditory perception. Vocabulary development. Improvement of comprehension through analysis of author's purpose and techniques. 2 lectures.

Psy 104 Effective Study Techniques (2)
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. 1 lecture, 1 quiz section.

Psy 202 General Psychology (3)
Biological individuality; heredity and environment; motives; emotions; sensory activity and its use by the individual; learning and remembering; thinking and creating; intelligence; abilities; personality; culture and the individual; oneself and others. 3 lectures.

Psy 301 Personality and Mental Health (3)
Factors of mental health; achieving efficiency; personality development; emotional control; social adaptation; improvement of thinking; religion; program for mental health. 3 lectures. Prerequisite: Psy 202

Psy 302 Psychology of Business and Industry (3)
Psychological factors involved in employer-employee relationships, an analysis of the current practices of business and industry relative to personnel procurement, placement, training, conditions of work and productivity, human relations, human engineering, wages, and job evaluation. 3 lectures.

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 202

Psy 401 Social Psychology (3)
Human behavior as a product of interaction and social process, nature of group life in relation to social groupings, social conflict, public opinion, group morale, social controls, leadership. 3 lectures. Prerequisite: Psy 202 or permission 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: 9 units of psychology.

Psy 433 Individual Intelligence Testing (4)
The concept of intelligence. Principles and procedures of individual intelligence testing. Supervised experience in the administration, scoring, and interpretation of standard individual intelligence tests. 2 lectures. 2 activity periods. Prerequisite: Psy 432

Psy 535 Psychology of Learning (3)
Principles and practices in the field of educational psychology including learning and its variables, general and specific abilities, and measurements as they apply to this area. 3 lectures. Prerequisite: Ed 312
The Department of English and Speech serves all divisions of the college by providing courses which will increase a student’s understanding, appreciation, and use of his language, both in writing and speaking. The department offers a variety of courses which, through close study of the works of acknowledged masters of language usage and through providing opportunities for the student himself to use language with greater accuracy and skill, contribute to the general education of majors in Agriculture, Engineering, the Applied Arts and Applied Sciences.

The primary occupational objective of the department is the preparation of qualified teachers of English for elementary and secondary schools. To produce teachers well versed in the areas of English commonly taught in the public schools, the major curriculum provides a balanced emphasis in study of the language and in the use of the language in composition and literature. A student majoring in English progresses through four significant steps in his education: first, a study of principles governing language, composition, and literature; second, a study of content illustrating these principles; third, application by the student of principles to content produced by himself and others; fourth, application of both principles and content to problems commonly met in the teaching situation.

For the purpose of assigning students to the appropriate level of training in language communication, a placement test is given. The test measures acceptable proficiency in language communication as revealed in sentence structure, appropriate usage, spelling, and paragraph units. Students who demonstrate considerable deficiency will be assigned to English 4, a preparatory course without credit toward a degree. A passing grade in this course entitles the student to enroll in English 104.

**CURRICULUM IN ENGLISH**

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<tbody>
<tr>
<td><strong>Freshman</strong></td>
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<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Basic Mathematics for General Education (Math 100)</td>
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<td>History of Civilization (Hist 101, 102, 103)</td>
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* A minimum of 15 units of natural science is required for graduation. (See General Education List). Include one sequence course which meets for three quarters with a minimum of 9 units.

** Satisfactory skill in typing is required for graduation. A student who does not type may satisfy the requirement by electing Bus 140, 141.
### Sophomore

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<td>European Literature (Eng 211)</td>
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<td>Cultural Anthropology (Ant 201)</td>
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<td>General Psychology (Psy 202)</td>
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<td>British Literature (Eng 214, 215, 216)</td>
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<td>Shakespeare (Eng 315)</td>
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Total: 16½ units

### Junior

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<td>Growth of American Democracy (Hist 304)</td>
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<td>American Literature (Eng 311, 312, 313)</td>
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<td>Advanced Composition (Eng 304, 305, 306)</td>
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<td>Logic (Phil 202)</td>
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<td><em>Art</em></td>
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<td>Children's Literature (Eng 205) or Oral Interpretation (Sp 305)</td>
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<td>Readings for Young Adults (Eng 316)</td>
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<td>Senior Project (Eng 461)</td>
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Total: 17 units

### Senior

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<td>Introduction to Philosophy (Phil 201)</td>
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<td>Senior Project (Eng 462)</td>
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<tr>
<td>Undergraduate Seminar (Eng 463)</td>
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<tr>
<td>Modern Novel (Eng 415) or Modern Poetry (Eng 416) or Elizabethan Drama (Eng 419)</td>
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<tr>
<td>History of the English Language (Eng 303)</td>
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<td>Modern English Grammar (Eng 302)</td>
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<td>Significant British Writers (Eng 417) or Significant American Writers (Eng 418)</td>
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<tr>
<td>Electives</td>
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</table>

Total: 16 units

### Descriptions of Courses in English

**Eng 4 Preparatory English (3)**

For the student who needs additional writing before English 104. Organization of ideas into logical, clear sentences and paragraphs. Taught primarily through intensive writing based on the student's interests and experience. 3 lectures.

**Eng 5 Intensive English for Foreign Students (6)**

For the foreign student who needs additional work with English as a foreign language. Practice in pronunciation, sentence structure, reading, and composition. Individual work in the language laboratory. Two 2-hour lectures, two 2-hour laboratories.

**Eng 100 Applied English Composition (3)**

Concentrated work in English composition, letter writing, reports, and language usage. May not be substituted for Eng 104 or Eng 105. Not open to degree students for degree credit. 3 lectures. Prerequisite: Satisfactory score on placement test or Eng 4

*A minimum of 15 units of natural science is required for graduation. (See General Education List). Include one sequence course which meets for three quarters with a minimum of 9 units.

† See General Education list.
Eng 104 Language Communication (3)
Written composition based on language study. Organization of content of sentences, paragraphs, and essays. Forms of exposition. 3 lectures. Prerequisite: Satisfactory score on placement test or Eng 4

Eng 105 Language Communication (3)
Continuation of written composition. Use of logic and argumentation. Development of effective style. Use of reference materials and preparation of term paper. 3 lectures. Prerequisite: Eng 104

Eng 106 Language Communication (3)
Continuation of written composition with emphasis on the critical paper. Supplementary practice in oral presentation. 3 lectures. Prerequisite: Eng 105

Eng 125 English Composition for Foreign Students (3)
Review of English fundamentals. Reading, letter writing, and composition. May be substituted for Eng 104. 3 lectures. Prerequisite: Satisfactory score on placement test or Eng 5

Eng 126 English Composition for Foreign Students (3)
Introduction to forms of exposition and logic. Use of reference materials and preparation of term paper. May be substituted for Eng 105. 3 lectures. Prerequisite: Eng 125

Eng 200 Intermediate Composition (3)
Review of American grammar and usage. Instruction and practice in written composition. 3 lectures. Prerequisite: Eng 106

Eng 201 Introduction to Fiction (2)
Understanding of the forms of fiction through guided class discussion of short stories and novels. Frequent written assignments. 2 lectures.

Eng 202 Introduction to Drama (2)
Understanding of the forms of drama through guided class discussion of plays. Frequent written assignments. 2 lectures. Prerequisite: Eng 104

Eng 203 Introduction to Poetry (3)
Understanding of the forms of poetry through guided class discussion of poems. Frequent written assignments. 3 lectures. Prerequisite: Eng 105

Eng 204 Letter Writing (2)
Letter writing problems, letters of application, inquiries, questionnaires. The psychology of modern business letters. 2 lectures. Prerequisite: Eng 105

Eng 205 Children's Literature (3)
Survey of stories, plays, and poems which are suitable for introducing literary values in the elementary grades. 3 lectures. Prerequisite: Eng 106 or permission of the instructor.

Eng 207 Introduction to Literature (2)
Introduction to major forms of literature. Study in depth of selected works with reading for appreciation. May not be elected by English majors. 2 lectures. Prerequisite: Eng 105

Eng 211, 212, 213 European Literature (3) (3) (3)
Directed readings in European literature from the Greeks and Romans to the present, exclusive of the British. 3 lectures. Prerequisite: Eng 105

Eng 214, 215, 216 British Literature (3) (3) (3)
Selected readings in British literature from the beginning to the mid-20th century. 3 lectures. Prerequisite: Eng 105
Eng 219  Technical Writing (3)
Preparation of training materials; popular presentation of technical data and conclusions; technical communication within industries. Extensive technical writing. 3 lectures. Prerequisite: Eng 105

Eng 301  Report Writing (3)
Study of the research paper in industry and engineering. Extensive writing experience. 3 lectures. Prerequisite: Eng 105

Eng 302  Modern English Grammar (3)
A comparative study of traditional and modern grammars. 3 lectures. Prerequisite: Eng 106

Eng 303  History of the English Language (3)
A study of the development of the English language from its origins to its present forms and practices. Required of all English majors. 3 lectures. Prerequisite: Eng 106, 214, 215, 216

Eng 304  Advanced Composition—Non-Fiction (3)
Instruction and practice in writing, revising, and evaluating various forms of non-fiction. 3 lectures. Prerequisite: Eng 106

Eng 305  Advanced Composition—Imaginative Writing (3)
Instruction and practice in writing, revising, and evaluating various kinds of imaginative composition. 3 lectures. Prerequisite: Eng 106, 201

Eng 306  Advanced Composition—Literary Criticism (3)
Instruction and practice in writing, revising, and evaluating various types of critical writing. 3 lectures. Prerequisite: Eng 106, 201, 202, 203

Eng 311, 312, 313  American Literature (3) (3) (3)
Directed readings in American writers from Colonial times to the present. 3 lectures. Prerequisite: Eng 105

Eng 315  Shakespeare (3)
An introduction to Shakespeare's plays. 3 lectures. Prerequisite: Eng 105

Eng 316  Readings for Young Adults (3)
A survey of readings in literature, suitable for use in secondary schools. 3 lectures. Prerequisite: Eng 106

Eng 317  Modern Drama (3)
A survey of British and American Drama of the 20th century. 3 lectures. Prerequisite: Eng 202

Eng 400  Special Problems for Advanced Students (1-2)
Independent or group study of selected problems in English. Total credit limited to 4 units. 1 or 2 meetings. Prerequisite: Permission of the department head.

Eng 415  Modern Novel (3)
Readings in representative 20th century novels with special emphasis on origins, form, style, and ideas. 3 lectures. Prerequisite: Eng 201 or 9 units of literature.

Eng 416  Modern Poetry (3)
Study of poetry as an art expression of the 20th century. 3 lectures. Prerequisite: Eng 203 or 9 units of literature.

Eng 417  Significant British Writers (3)
Study in depth of selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 3 lectures. Prerequisite: Eng 214, 215, 216
Eng 418 Significant American Writers (3)
Study in depth of selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 3 lectures. Prerequisite: Eng 311, 312, 313 or permission of the instructor.

Eng 419 Elizabethan Drama (3)
A survey of the English drama from its beginning to 1642, excluding Shakespeare. 3 lectures. Prerequisite: Eng 202, 214

Eng 461, 462 Senior Project (2) (2)
Selection and completion of a project under minimum supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum 120 hours total time.

Eng 463 Undergraduate Seminar (2)
Reports of senior projects, discussion of professional articles on an appropriate level. 2 lectures. Prerequisite: Completion of Senior Project.

Eng 521 Curriculum and Methods in English (3)
Instruction in composition and literature as they may be applied to secondary school teaching. 3 lectures. Prerequisite: Admission to teacher education program or graduate standing.

Eng 590 Graduate Seminar in English (1-3)
Independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Graduate standing in English.

DESCRIPTIONS OF COURSES IN SPEECH

Sp 201 Public Speaking (2)
Training in giving speeches before audiences. Experience in practical speaking situations. 1 lecture, 1 two-hour laboratory. Prerequisite: Eng 105

Sp 202 Advanced Public Speaking (2)
Practice in the composition and delivery of various types of speeches. Emphasis on speeches related to the student's vocational objective. 1 lecture, 1 two-hour laboratory. Prerequisite: Sp 201

Sp 214 Introduction to Radio and Television Programming (3)
History of American broadcast media, FCC licensing and control, advertising practices, and trends in programming. Production of special types of program. 3 lectures. Prerequisite: Sp 201

Sp 220 Introduction to Theater (3)
Theatrical terminology, basic stagecraft and lighting, stage management, theater practice. Historical development of the theater. 2 lectures, 1 two-hour laboratory.

Sp 221 Stagecraft (3)
Scenery design, construction, painting, lighting, costumes, and make-up. 1 lecture, 2 two-hour laboratories. Prerequisite: Sp 220

Sp 231 Applied Theater Practices (2)
Preparation of a play for public presentation, including scene construction and painting, lighting, mounting of sets, shifting sets, properties, costumes, make-up, sound effects, publicity, and house management. For students working on college plays. May be repeated to 12 units. 2 three-hour laboratories.

Sp 301 Debate (2)
Study of the current debate question selected for American colleges. Preparation of briefs and practice in debating. May be repeated for 6 units. 2 two-hour laboratories. Prerequisite: Sp 202
Sp 302 Speech Correction (2)
Common and typical speech deviations usually found in American speech. Procedures for the improvement and correction of speech. 1 lecture, 1 two-hour laboratory. Prerequisite: Sp 201

Sp 304 Persuasion (2)
Basic theory of persuasive speaking. Preparation and delivery of speeches designed to secure hearer's acceptance of the speaker's views. 1 lecture, 1 two-hour laboratory. Prerequisite: Sp 202

Sp 305 Techniques of Oral Reading (3)
Selection, preparation, and presentation of material for oral reading. Experience in individual and choral reading. 2 lectures, 1 two-hour laboratory. Prerequisite: Sp 202

Sp 321 Acting and Directing (3)
Basic acting and directing techniques, improvisation, characterization, pantomime, and movement. 1 lecture, 2 two-hour laboratories. Prerequisite: Sp 220

Sp 347 Creative Speech Activities (2)
Role playing, group dramatization, and related activities. For students preparing to teach in the elementary school. 2 two-hour laboratories. Prerequisite: Sp 202

Sp 401 Voice and Diction (2)
Concentration on special skills of enunciation and articulation, phonetics, pronunciation, and voice improvement. 1 lecture, 1 two-hour laboratory. Prerequisite: Sp 302

Sp 403 Discussion Techniques (2)
Role of spoken discourse in the solution of problems. Special emphasis on forms of discussion: panels, forums, and symposiums. 1 lecture, 1 two-hour laboratory. Prerequisite: Sp 304

Sp 451 Radio and Television Production Laboratory (2)
Practical work on programs for radio and/or television, including writing of original and adapted program material. May be repeated to 6 units. 2 two-hour laboratories. Prerequisite: Sp 214

Sp 590 Graduate Seminar in Speech (1-3)
Readings and papers on special problems in selected areas of speech. Total credits limited to 6 units. 1-3 lectures. Prerequisite: Graduate standing.

DESCRIPTION OF COURSES IN SPANISH

Span 221, 222, 223 Conversational Spanish (3) (3) (3)
Oral drill and conversational practice. Class drill in pronunciation, sentence structure, vocabulary, and basic conversation in relation to Latin-American usage. Listening and responding to recorded materials. 2 lectures, 1 two-hour laboratory.
The objectives of the Home Economics Department are to provide education for persons interested in homemaking, in teaching homemaking in secondary schools, extension service, home economics journalism, home equipment demonstration work, food administration, and other occupations closely related to homemaking.

For those who wish to broaden their general education, the Home Economics Department offers courses which enrich personal and family life through the development of basic concepts and skills. Students are invited to consult with a staff member of the department concerning their special interests in homemaking and family life education.

Considerable emphasis is placed upon applied courses in the first two years. These courses are designed to increase the employability of the student after the first two years of study and also afford a substantial basis for successful marriage and family life.

Since studies show that there will be a shortage of homemaking teachers in secondary schools for some time, the graduate who holds a teaching credential in homemaking education will have numerous employment opportunities. The student preparing to teach should refer to the section of the catalog which gives information regarding preparation for credentials for public school service.

**CURRICULAR OPTIONS**

**General Home Economics**

The General Home Economics option prepares the homemaker whose chief responsibilities are as a wife and mother. It also leads to positions in home service departments of utility and appliance companies, child care centers, consumer education, and home furnishing establishments. In addition, the student may qualify to teach homemaking in secondary schools.

**Food Administration**

The Food Administration option prepares for the management of institutional and commercial food service programs. Membership in the American Dietetic Association is available to graduates following a one-year hospital dietetic internship. Students may concentrate either in administrative dietetics or in administration.

**CURRICULUM IN HOME ECONOMICS**

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<tr>
<td>Advanced Composition (Eng 314)</td>
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<td>Art in the Home (Art 238)</td>
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<td>Orientation to Home Economics (HE 101)</td>
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<td>Clothing Selection and Construction (HE 131)</td>
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California State Polytechnic College

### Sophomore

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<td>General Psychology (Psy 202)</td>
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<td>Sociology of Family Life (Soc 206)</td>
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<td>Home Nursing (HE 222)</td>
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**Total:** 16 ½ 17 ½ 16 ½

### Junior

*Literature

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<td>Growth of American Democracy (Hist 304)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Family Nutrition (HE 321)</td>
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<td>U. S. In World Affairs (Hist 305)</td>
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<td>Senior Project (HE 461)</td>
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### Senior

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<tr>
<td>Senior Project (HE 462)</td>
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<td>Undergraduate Seminar (HE 463)</td>
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<td>Home Management (HE 423)</td>
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<td>Meal Management (HE 421)</td>
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### GENERAL HOME ECONOMICS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

#### Freshman

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<tr>
<td>Soc Sc 101 Introduction to the Social Sciences</td>
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<tr>
<td>HE 123 Personal and Home Management</td>
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#### Junior

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<tr>
<td>Art 321 Applied Color and Design</td>
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<td>HE 322 Textiles</td>
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<td>Arch 312 Home Design</td>
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<td>HE 323 Home Decoration</td>
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<tr>
<td>HE 333 Costume Design and Construction</td>
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**Total:** 3

#### Sophomore

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<td>PSc 103 General Physical Science</td>
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<tr>
<td>Ec 105 Consumer Economics</td>
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*To be selected from the General Education list.
FOOD ADMINISTRATION OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman

Chem 324-5 General Inorganic Chemistry .......................... (8)
Chem 326 Organic Chemistry ........................................... (4)
Acctg 221-2 Principles of Accounting ................................. (8)

Junior *

Bact 324-5 Sanitary Inspection and Control ............................ (2)

Senior

HE 425 Quantity Cookery .................................................. (3)
HE 426 Food Production Management .................................... (3)
HE 427 Equipment and Layout ............................................. (3)
HE 428 Advanced Nutrition ................................................ (3)

Sophomore

Soc Sc 101 Introduction to the Social Sciences .......................... (3)
Bus 104 Office Organization and Operation .............................. (3)
FI 209 Meats ........................................................................ (2)
Bus 206 Purchasing ............................................................. (3)

DESCRIPTIONS OF COURSES IN HOME ECONOMICS

HE 101 Orientation to Home Economics .................................... (1)
Descriptions of and preparation for various careers in home economics presented by professional people in the field. What is expected of home economics majors on campus and of home economists in communities. 1 lecture.

HE 103 Problems of the Beginning Family ................................ (2)
Development and growth of the child during prenatal life and infancy; care and health of the mother; psychological and economic implications involved in adding children to the family. 2 lectures.

HE 121 Family Meals ........................................................... (3)
Preparation of economical, nutritious, and appetizing family meals with particular emphasis on time management for employed homemakers. Study of the association between family meals and family relationships. 2 lectures, 3 one-hour laboratories.

HE 123 Personal and Home Management .................................. (3)
Home management as it is affected by personal and family situations. Utilizes actual living arrangements of students. 2 lectures, 1 two-hour laboratory.

HE 131 Clothing Selection and Construction .............................. (3)
Personality expression through clothing selection. Fitting commercial patterns to figure problems; modern precision techniques of clothing construction. 1 lecture, 2 laboratories.

HE 142 Home Furnishings ...................................................... (2)
Consumer approach to home furnishings through upholstering a unit of furniture and drapery construction. 2 laboratories.

HE 221 Foods for Special Occasions ......................................... (2)
Planning, preparing, and serving meals for large family groups, community groups, or special occasions involving groups of medium size. Etiquette of proper table setting and service. 1 lecture, 1 laboratory. Prerequisite: HE 121

HE 222 Home Nursing ........................................................... (2)
Care of the sick in the home as related to the welfare of the entire family. 1 lecture, 1 two-hour laboratory.

HE 225 Demonstration Techniques .......................................... (2)
Instruction in the technique of demonstrations; planning and giving demonstrations for different groups; lecture-demonstrations by specialists from commercial field. 1 lecture, 1 two-hour laboratory. Prerequisite: Sophomore standing.

* Of the elective units in the junior year 15 must be chosen with the approval of the adviser in a field of concentration.
HE 231 Household Equipment (3)
Efficient selection, use and maintenance of common types of household equipment. Simple repairs and adjustments. 2 lectures, 1 two-hour laboratory. Prerequisite: PS 102 or equivalent.

HE 233 The Child and the Family (4)
Study of children in the family-centered home including observation and participation in the child care laboratory and conferences with parents for gaining insight into child development and competency in care of children. 2 lectures, 2 laboratories. Prerequisite: PS 202 or Soc 206 or HE 103

HE 241 Family Clothing (2)
Selection and construction of clothing for adults and children. 2 laboratories. Prerequisite: HE 131 or permission of instructor.

HE 321 Family Nutrition (3)
Chemical composition of foods and their utilization in the body. Relation of adequate diet to physical and mental health of various family members. 2 lectures, 1 laboratory. Prerequisite: HE 121, 221

HE 322 Textiles (2)
Sources and characteristics of natural and synthetic fibers. Fabrics, weaves, and textile finishes. Consumer approach to textile fabrics—selection, use and care. 1 lecture, 1 laboratory. Prerequisite: PS 103 or equivalent.

HE 323 Home Decoration (2)
Selection and arrangement of furnishings as they relate to expression of personality, architectural design and setting. 1 lecture, 1 laboratory. Prerequisite: HE 142, Art 321, Arch 312

HE 325 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 laboratory. Prerequisite: HE 121 or 221

HE 332 Finishing Techniques (2)
Finishing old and unpainted furniture and built-ins. Repairing, finishing walls and woodwork in a home. Individual problems. 2 laboratories.

HE 333 Costume Design and Construction (3)
Fundamentals of designing by flat pattern and French draping. Designing for the individual and the fabric. Advanced construction and fitting techniques. 1 lecture, 2 laboratories. Prerequisite: Art 321, HE 241, 322

HE 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation. Total credit limited to four units with not more than two units in any one quarter. 1 or 2 meetings. Prerequisite: Senior standing or consent of instructor.

HE 411 Methods and Materials for Homemaking Instruction (4)
Development of a timely philosophy in 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. 4 lectures. Prerequisite: Ed 312

HE 413 Adult Homemaking Education (2)
Curriculum materials, procedures, teaching aids and evaluative techniques for teaching adult homemaking. 2 lectures. Prerequisite: HE 411

HE 421 Meal Management (4)
Experience in menu planning and meal service for groups with emphasis on food buying, catering and management. 2 lectures, 2 laboratories. Prerequisite: HE 321
HE 423 Home Management (4)
The application of homemaking courses in a family-type house emphasizing experiences in decision making, group relationships, and family living. 1 lecture, 3 laboratories. Prerequisite: Senior standing.

HE 425 Quantity Cookery (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 laboratories. Prerequisite: HE 321

HE 426 Food Production Management (3)
Principles of successful organization and management and their application to the effective operation of food service. Production of quality food for group service within a pre-determined budget. Leadership responsibilities of the food service manager. Advance reservation with instructor required. 2 lectures, 1 laboratory. Prerequisite: HE 425

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. 2 lectures, 1 laboratory. Prerequisite: HE 426

HE 428 Advanced Nutrition (3)
Introduction to therapeutic diets, history of nutrition, and individual exploration in a selected area of recent research. 2 lectures, 1 laboratory. Prerequisite: HE 321, PSC 103 or equivalent.

HE 433 Historic Costume (3)
Study of the past through present forms of world dress. Correlation of costume to social and economic life. Illustration and creation of original designs. 1 lecture, 2 laboratories. Prerequisite: HE 333

HE 442 Tailoring (2)
Selection and construction of garments requiring tailoring techniques. 2 laboratories. Prerequisite: HE 333 or permission of instructor.

HE 461, 462 Senior Project (2) (2)
Selection and completion of a project with a minimum of supervision, the project to be related to a probable field of employment. Results of the study are presented in a formal report. Minimum of 120 hours to be used in making the study.

HE 463 Undergraduate Seminar (2)
Study and discussion of current developments in the field of home economics. 2 lectures. Prerequisite: Senior standing.

DESCRIPTION OF PROFESSIONAL COURSE FOR SCHOOL LUNCH PERSONNEL

HE 621 Workshop for School Lunch Personnel (1½)
A series of lectures, seminars, demonstrations, and discussions of school lunch problems and developments led by specialists in the field. Designed to meet the needs of school lunch personnel through the State. Course content will vary from summer to summer. One week summer course.
The purposes of the courses in the Music Department are to give all musically inclined students the opportunity to participate in college musical organizations and to further their proficiency both in singing and in playing instruments; to give all students interested in music a broader insight into the general field of music through courses in appreciation, theory, harmony, and music history; and to provide the prospective teacher with basic skills and instructional techniques in music required for the general elementary credential.

It is necessary that the student have some previous experience with a musical instrument in order to try out for band, brass, string, and woodwind ensembles, and for dance orchestra. While previous experience in choral singing is helpful, it is not mandatory for the student trying out for the men's glee club and the women's glee club.

Students enrolled in one of the teacher education majors may elect a minor in music. This program requires that a minimum of 30 units be taken, at least 18 of which must be 300 or 400 numbered courses. Those interested in this program should consult an instructor in the Music Department. Demonstration of music skill in piano may be by audition or by satisfactory performance in Mu 111, 112, 113. Participation in a music activity for at least three quarters is recommended.

**DESCRIPTIONS OF COURSES IN MUSIC**

**Mu 101 Music Theory (3)**
Elements of music theory covering: notation, construction of major and minor scales and keys, signatures, intervals, diatonic triads, triad forms, inversions, transposition, study of meter and rhythm, elementary ear training. 3 lectures.

**Mu 111, 112, 113 Piano—Theory and Performance (1) (1) (1)**

**Mu 141 Dance Orchestra (2)**
Limited to those who have had considerable experience playing musical instruments. Students in the dance orchestra have an opportunity to play for various College entertainments, dances, community programs, radio broadcasts, and the annual spring tour and Home Concert. 2 laboratories. Total credit limited to 24 units.

**Mu 144 Symphony Orchestra (1)**
Open to any college student whose technique is adequate. Standard orchestral repertory. Several informal, public concerts each season. 1 laboratory. Prerequisite: permission of the instructor. Total credit limited to 12 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 12 units.

**Mu 151 Band (1)**
Limited to those students who have had experience with band instruments. The band plays for many college functions, assemblies, athletic games, and rallies, and makes at least one trip each year. Smaller groups are organized from the band for special functions. 1 laboratory. Total credit limited to 12 units.
Mu 154  Men's Glee Club (1-2)

Four- to eight-part vocal compositions; fundamentals of breathing, tone production, diction, and interpretation. Quartets, small groups, and soloists are developed, for which additional credit may be given. The club sponsors an annual spring tour and Home Concert. Tryouts in fall only. 1 or 2 laboratories. Total credit limited to 24 units.

Mu 157  Women's Glee Club (1-2)

Choral literature for women's voices; independence and skill in part singing; care and development of the voice; choral interpretation; performances in public concerts, campus functions, and the annual Home Concert. Small groups and soloists may earn additional credit. 1 or 2 laboratories. Prerequisite: Permission of the instructor. Total credit limited to 24 units.

Mu 201  Basic Music for Classroom Teachers (3)

Development of basic music skills necessary for teaching music; singing, conducting, playing simple instruments, accompaniment, rhythmic activities. Development of a basic repertoire of children's songs. Assumes a knowledge of music fundamentals. 3 lectures.

Mu 203  Elementary Harmony (3)

Melodic form; recognition, construction, and use of primary chords and inversions; cadences, enharmonic change, harmonization of simple melodies, and arranging for four-part strings. 3 lectures. Prerequisite: Mu 101

Mu 204, 205, 206  Appreciation (2) (2) (2)

Survey of forms, materials, and composers found in modern radio and concert programs presented through lectures and recordings. Study of choirs and instruments of the symphony orchestra; development of folk songs into symphonic themes and treatment; study of contemporary artists. 2 lectures.

Mu 211, 212, 213  Piano—Theory and Performance (1) (1) (1)

Upper elementary piano grades: Selections as from C.P.E. Bach, J. S. Bach; 18 Little Preludes and Fugues; Clementi Sonatinas (Op. 36), Six Sonatinas by Haydn, Mozart, Beethoven (Fisher), Master Series for the Young. 1 activity.

Mu 231, 232, 233  Instruments—Theory and Performance (1) (1) (1)

Study of the fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. 1 activity.

Mu 237, 238, 239  Voice—Theory and Performance (1) (1) (1)

Study of the fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Theory of music as applied to voice production; notation, intervals, triad forms, meter and rhythm, major and minor scales. 1 activity.

Mu 307, 308, 309  Conducting (2) (2) (2)

Principles and techniques in conducting with experience in score reading. 2 lectures.

Mu 311, 312, 313  Piano—Theory and Performance (1) (1) (1)

Intermediate piano grades: Selections as Bach Small Preludes and easier two-part Inventions; Clementi and Dussek Sonatinas, Haydn Sonatinas, easier Mozart and Beethoven Sonatas. All diminished and dominant seventh chords in four positions. 1 activity.

Mu 331, 332, 333  Instruments (1) (1) (1)

Study of the fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Continuation of Mu 231, 232, 233. 1 activity.
Mu 337, 338, 339 Voice (1) (1) (1)
Study of the fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Theory of music as applied to voice production; notation, intervals, triad forms, meter and rhythm, major and minor scales. Continuation of Mu 237, 238, 239. 1 activity.

Mu 404, 405, 406 History of Music (2) (2) (2)
A chronological study of music from the earliest times to the contemporary scene. Selected readings, recordings, and scores will be intensively studied. 2 lectures.

Mu 431, 432, 433 Advanced Instruments—Theory and Performance (1) (1) (1)
Emphasis placed on the physiological and acoustical principles of tone production. Selected readings on the history and literature of each family of instruments. 1 activity.

Mu 436 Teaching Music in the Elementary Schools (3)
Principles and techniques of conducting the teacher's own program; investigation of currently used materials. Development and use of simple rhythm instruments. Techniques of correlating music with other subject areas. Includes development of teaching skills. 3 lectures. Prerequisite: Mu 101, 201, or consent of the instructor.

Mu 437, 438, 439 Advanced Voice—Theory and Performance (1) (1) (1)
Selected readings in the theory of voice production. Study of many types of vocal literature. 1 activity. Prerequisite: Mu 237
PHYSICAL EDUCATION DEPARTMENT
Acting Department Head, Richard Anderson

Victor Buccola  James J. Jensen  Joan Pattison
Sheldon Harden  Edward J. Jorgensen  Doris Ann Thomas
William Hicks  Thomas J. Lee  Mary Lou White
Vaughan Hitchcock  Richard B. McElveny  Walter G. Williamson
Leroy B. Hughes  Robert A. Mott

The major function of the Department of Physical Education is to provide both required and elective courses in physical education and health to meet the general education needs of all students. To supplement this general education, the department administers an extensive intramural sports program for all students of the college. A second function of the department is to prepare both men and women as secondary teachers in the fields of physical education, health, safety education, and driver training. By proper selection of elective courses, the student can prepare for work in the recreation area.

Because of an ideal geographical location and outstanding physical education facilities, the college 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 adjacent to the Men's Physical Education Building. A modern football stadium, regulation baseball diamond with permanent stands and quarter-mile track with a 220-yard straightaway provide outstanding facilities for intercollegiate athletic teams. Basketball, volleyball, handball, shuffleboard and all-weather tennis courts are also available for student use. The Men's 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 and three intramural basketball courts. It also has a wrestling room, weight training area and a gymnastic room. All these facilities are adjacent to the men's locker and shower room.

The women's program is centered in Crandall Gym which has adequate facilities for basketball, volleyball, badminton, gymnastics. A dance studio and an adaptive physical education laboratory are located in this area. A 75-foot 5-lane competitive swimming pool is adjacent to Crandall Gym and shower and locker rooms.

CURRICULUM IN PHYSICAL EDUCATION

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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Basic Mathematics for General Education (Math 100, 200)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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<td>Safety and First Aid (PE 121)</td>
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<td>Community Recreation (PE 126)</td>
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<td>Swimming and Water Sports (PE 123)</td>
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<td>Apparatus and Gymnastics (PE 255M) or (PE 255W)</td>
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<td>School and Community Health Education (PE 203)</td>
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* To be selected from the General Education list.
Junior (Men)

American Government (Pol Sc 301) ......................................................... 3
Growth of American Democracy (Hist 304) ................................................. 3
Literature ........................................................................................................... 3
Literature, Art or Music .................................................................................. 3
Educational Psychology (Ed 312) .................................................................. 3
Football Coaching Theory and Practice (PE 321) ......................................... 2
Track and Field Theory and Practice (PE 333) .............................................. 2
Baseball Theory and Practice (PE 323) .......................................................... 2
Teaching Physical Education in Elementary Schools (PE 332) ..................... 3
Physiology of Exercise (PE 303) ................................................................. 2
Techniques of Officiating (PE 331) ............................................................... 2
Physical Education Activity (PE 341, 342, 343) ........................................... 1
Kinesiology (PE 302) ....................................................................................... 2
Electives .......................................................................................................... 6

Total: 17 F 16 W 17 S

Senior (Men)

State and Local Government (Pol Sc 401) ...................................................... 3
Senior Project (PE 461, 462) ........................................................................ 2
Undergraduate Seminar (PE 463) ................................................................. 2
U.S. in World Affairs (Hist 305) ................................................................. 3
Basketball Theory and Practice (PE 422) ...................................................... 2
Minor Sports Theory and Practice (PE 441, 442, 443) .................................. 1
Organization and Administration of Physical Education (PE 401) ................. 3
Tests and Measurements in Physical Education (PE 425) ............................ 3
Administration of School Health Education (PE 405) .................................. 2
Athletic Training and Massage (PE 432M) ..................................................... 1
Adaptive Physical Education (PE 406) .......................................................... 2
Curriculum and Methods of Physical Education (PE 403) ............................. 3
Electives ........................................................................................................... 4

Total: 16 F 16 W 16 S

DESCRIPTIONS OF COURSES IN PHYSICAL EDUCATION

PE 107 Health Education (2)
Personal hygiene and health education; relation of exercise and nutrition; and application of the rules of hygiene in maintaining physical and mental health. Fire prevention and public safety; alcohol and other drugs. Required for freshmen and sophomores. 2 lectures.

PE 121 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 123 Swimming and Water Sports—Theory and Practice (2)
Supervision of pool activities. Swimming instruction and safety. Teaching and coaching swimming and water polo. 1 lecture, 1 two-hour laboratory. Prerequisite: Demonstrated swimming ability.

PE 126 Community Recreation (3)
The supervision and administration of community recreational activities from the viewpoint of school, city and recreation commission administration; games and activities suitable for recreation programs. 1 lecture, 2 two-hour laboratories.

PE 141 Physical Education (½)
Swimming, field and court sports, gymnastics, combatives for men, dance for women. 2 one-hour periods. Total credit limited to 1½ units.
BEGINNING SWIMMING (1/2) (½)
Beginning swimming for all who do not pass college swimming test. 2 one-hour periods.

ADAPTIVE ACTIVITIES (½)
Group and individual exercise based upon individual needs in posture, body mechanics, nutrition, post injury and illness, and cardiac cases. Students take this course in lieu of PE 141 or 241 upon recommendation of the college physician. 2 one-hour periods. Total credit limited to 3 units.

COMPETITIVE ATHLETICS (½)
May be substituted for required physical education by those qualified to compete in intercollegiate sports program. 10 hours activity. Total credit limited to 1½ units.

PRINCIPLES OF PHYSICAL EDUCATION (3)
History of physical education and the concept of physical education as a profession. Correlation between principles and methods. 3 lectures.

SCHOOL AND COMMUNITY HEALTH EDUCATION (2)
Organization and administration of the school health program and its interrelationship to community health agencies; underlying principles; legal aspects; administrative divisions of health instruction, health services, and healthful school living. 2 lectures.

ADMINISTRATION OF RECREATION (3)
Supervision and administration of recreation with consideration of facilities, budget, equipment maintenance, public relations, and special activities. 2 lectures, 1 two-hour laboratory.

INTRAMURAL SPORTS (3)
The principles and policies underlying programs of intramural sports in secondary schools and community centers. 2 lectures, 1 two-hour laboratory.

SPORTS EDUCATION (1/2)
Tennis, golf, badminton, squash, archery, volleyball, advanced swimming, American Red Cross lifesaving, synchronized swimming, bowling, and handball. 2 one-hour periods. Total credit limited to 1½ units.

ADVANCED SWIMMING AND LIFESAVING (1)
Lifesaving techniques. The Senior Red Cross Life Saving and Water Safety Certificate will be issued to those students who satisfactorily complete this course. 2 two-hour laboratories.

COMPETITIVE ATHLETICS (½)
May be substituted for required physical education by those qualified to compete in intercollegiate sports program. 10 hours activity. Total credit limited to 1½ units.

APPARATUS AND GYMNASTICS (2)
A critical analysis of the methods and problems in teaching and coaching apparatus and gymnastics. Application is made to the secondary teaching situation with emphasis on lesson planning, development of teaching units, organization for class activity and administration of the program. 1 lecture, 1 two-hour laboratory.

APPARATUS AND GYMNASTICS (2)
Progression and teaching techniques in tumbling and gymnastic stunts. 1 lecture, 1 two-hour laboratory.

SAFETY EDUCATION (3)
Principles and practices of safety as applied to home, fire, industrial, school, community, and traffic situations. Accident prevention. 3 lectures.
PE 302  Kinesiology  (2)
  Energy, leverage, angle positions, sequence, and efficiency applied to body move-
ments in sports and working conditions. 2 lectures.

PE 303  Physiology of Exercise  (2)
  Effects of various forms of physical activity on the circulatory, respiratory, and
other physiological processes; physiological problems in athletic competition. 2
lectures.

PE 320  Driver Education and Driver Training  (3)
  Recommended procedures used in training drivers of high school ages. Attitudes
and practices; behind-the-wheel teaching techniques. 2 lectures, 1 two-hour labora-
tory.

PE 321M  Football Coaching Theory and Practice  (2)
  Fundamentals and systems of offensive and defensive football. Care and purchase
of equipment, supplies and facilities. Rules of the game. 1 lecture, 1 two-hour labora-
tory.

PE 322M  Baseball Coaching Theory and Practice  (2)
  A critical analysis of the methods and problems of teaching and coaching base-
ball at the secondary school level. Emphasis on strategy, selection of players, offici-
ating, interpretation of rules, scoring, and administration of interschool games.
  1 lecture, 1 two-hour laboratory.

PE 324W, 325W, 326W  Teaching Progression in Girls' Sports  (2)  (2)  (2)
  Fundamentals and techniques of the following sports: Basketball, badminton,
archery, tennis, soccer, speedball, hockey, volleyball, golf. 1 lecture, 1 two-hour labora-
tory.

PE 331M  Techniques of Officiating  (2)
  Techniques of officiating men's sports. 1 lecture, 1 two-hour laboratory.

PE 332  Teaching 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. 1 lecture, 2 two-hour laboratories.

PE 333M  Track and Field Coaching Theory and Practice  (2)
  Coaching techniques for various track and field events. Problems of team balance;
study of rules. 1 lecture, 1 two-hour laboratory.

PE 334  Introduction to Dance  (3)
  Basic elements of music as applied to movement. 1 lecture, 2 two-hour labora-
tories.

PE 337  Camping and Outdoor Education  (3)
  Introduction to current status, principles, organization and administration of
outdoor education and camping. 2 lectures, 1 two-hour laboratory.

PE 341, 342, 343  Direction of Physical Education Activity  (1)  (1)  (1)
  Required of all majors in physical education. Students conduct regular physical
education classes under supervision of staff. 2 one-hour periods.

PE 400  Special Problems for Advanced Undergraduates  (1-2)
  Total credit limited to 4 units with not more than 2 units in any one quarter.
Prerequisite: Senior standing or permission of the 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. Legal aspects and the interrelationships
with the general school curriculum at the local, state, and national levels. 3 lectures.
PE 403 Curriculum and Methods in Health and Physical Education (3)
Methods, curricular materials, and evaluation procedures in elementary and
secondary schools health and physical education. Directed observations, field ex-
perience; class organization, management of games and relays. 3 lectures.

PE 405 Administration of School Health Education (2)
Current procedures and practices in the administration of the school health
program. Problems analyzed and recommended procedures stressed. 2 lectures.

PE 406 Adaptive Physical Education (2)
Growth and development patterns; their relation to special and regular physical
education programs. Analysis of postural divergence and procedures for prevention
and correction. 2 lectures. Prerequisite: PE 303

PE 422M Basketball Coaching Theory and Practice (2)
Fundamental individual basketball skills. Theories of offensive and defensive team
play. 1 lecture, 1 two-hour laboratory.

PE 425 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. 3 lectures.

432M Athletic Training and Massage (1)
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. 1 combined lecture and laboratory.

PE 441M, 442M, 443M Minor Sports Theory and Practice (1) (1) (1)
Fundamentals and techniques of the following minor sports: boxing, wrestling,
tennis, golf, gymnastics, badminton, and handball. 1 two-hour laboratory.

PE 446W, 447W, 448W Teaching Progression in Dance (2) (2) (2)
Teaching progression in dance: folk, contemporary, and social. 2 two-hour
laboratories. Prerequisite: PE 334

PE 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

PE 463 Undergraduate Seminar (2)
Discussion of new developments in recreation, health, and physical education.
2 lectures.

PE 501 Advanced Adaptive Physical Education (3)
Advanced techniques in the detection of defective body mechanics and establish-
ment of class procedures for prevention and elimination of these defects. 3 lectures.

PE 502 Advanced 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 Supervision in Physical Education (3)
Principles and techniques in supervision of physical education on the elementary
and secondary school levels. 3 lectures.

PE 512 Advanced Seminar in Health Education (3)
Rules of hygiene; problems of healthful living, and school hygiene. 3 lectures.

PE 513 Evaluation of Current Studies (4)
Analysis and evaluation of published studies in physical education, health educa-
tion and recreation. 4 lectures.
The Printing Department offers a four-year curriculum in printing engineering and management, leading to a Bachelor of Science degree in Applied Arts with a major in Printing Engineering and Management. The curriculum is designed to prepare graduates for positions of responsibility in the allied trades of the printing and graphic arts industry, as well as to prepare them to be owners and operators of newspapers and printing plants. Majors must not only complete satisfactorily the printing engineering and management curriculum requirements but must show proper aptitude and progress to indicate they may assume positions of responsibility and leadership in the printing and graphic arts industry.

A student successfully completing the four-year curriculum will be qualified to hold responsible positions in many branches of the graphic arts industry. A graduate has sufficient skill in all phases of printing and an adequate background of management and production practices so that he may accept positions of responsibility in production control, management, and sales and service. A graduate is qualified to operate his own print shop, or to publish a newspaper in connection with a job printing plant. A student who terminates his formal education prior to graduation still will have sufficient training to qualify him for positions in the printing and graphic arts industry.

The department is completely equipped with Intertype and Linotype typesetting machines, Elrod, Ludlow, platen presses, automatic job and cylinder presses, folding machines, hand and power paper cutters, perforators, drilling and punching machines, power stitchers, a wide assortment of new and modern type, stereotype equipment, darkroom and process camera equipment, stripping, plate-making and many other types of lithography and reproduction process equipment.

Practical instruction in management, cost estimating, plant organization and layout, and shop management is given in the senior year.

CURRICULUM IN PRINTING ENGINEERING AND MANAGEMENT

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<td>Graphic Design and Display (Pr 103)</td>
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<td>Elementary Typography (Pr 121)</td>
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<td>Hand-Fed Platen Presswork (Pr 131)</td>
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<td>Bindery Operations (Pr 151)</td>
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**Sophomore**

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<td>Automatic Cylinder Presswork (Pr 232)</td>
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<td>Composing Machine Operation (Pr 241, 242, 243)</td>
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<td>Publication Makeup and Markup (Pr 332)</td>
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**DESCRIPTIONS OF COURSES IN PRINTING ENGINEERING AND MANAGEMENT**

**Pr 101 History of Printing (2)**

Development of the historical background of printing and lithography from its origin to the time of Gutenberg, continuing through changes in materials and equipment to the highly developed industry of today. Analysis of trade requirements and job opportunities. 2 lectures.
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr 102</td>
<td>Proofreading (2)</td>
<td></td>
<td>Printshop English, proofreading, spelling, punctuation, division of words, compounding, style. Practical experience on the college paper and other publications. 2 lectures.</td>
</tr>
<tr>
<td>Pr 103</td>
<td>Graphic Design and Display (3)</td>
<td></td>
<td>Principles of design and display. Study of type classifications and their adaptation to good typography and art. Proper use of cuts, ornaments, borders, spacing and most effective arrangements of type to give greatest emphasis to artistic arrangement and display value. 3 lectures.</td>
</tr>
<tr>
<td>Pr 121</td>
<td>Elementary Typography (4)</td>
<td></td>
<td>Elementary training in fundamentals of typesetting, spacing, ornamentation, typographic styles, composing room procedures and practices. Principles of display, study of various type classifications and their adaptation to typography and proper use of copy-fitting. 2 laboratories. Prerequisite: Pr 103</td>
</tr>
<tr>
<td>Pr 123</td>
<td>Introductory Production Problems (3)</td>
<td></td>
<td>Proper use and operation of all printshop equipment. Safety and accident prevention. Familiarization with cost and labor-saving machines and devices. Care and operation of stereotype equipment, including routers, shavers, saws, shellcast and type-high stereotypes and metallurgy. Color reproduction from stereotype casts. 2 lectures, 1 laboratory. Prerequisite: Pr 103</td>
</tr>
<tr>
<td>Pr 131</td>
<td>Hand-fed Platen Presswork (3)</td>
<td></td>
<td>Introduction to platen press. Instruction in care and maintenance, lockup of forms, makeready, and nomenclature of all types of platen presses. Practical experience in feeding and operation of presses. 1 lecture, 2 laboratories.</td>
</tr>
<tr>
<td>Pr 132</td>
<td>Automatic Platen Presswork (3)</td>
<td></td>
<td>Operation and maintenance of automatic fed platen presses, proper positioning and lockup of type forms, makeready, and correct use of inks, scoring rules and perforating. 1 lecture, 2 laboratories. Prerequisite: Pr 131</td>
</tr>
<tr>
<td>Pr 133</td>
<td>Introduction to Cylinder Press (2)</td>
<td></td>
<td>Study of development and advantages of the cylinder press. Practical hand feeding and care of press, ink, and rollers in actual production of College newspaper and other projects. 1 lecture, 1 laboratory.</td>
</tr>
<tr>
<td>Pr 151</td>
<td>Bindery Operation (3)</td>
<td></td>
<td>Use of bindery equipment, its maintenance and repair, imposition, manual operations, and handling. Actual practice on all kinds of commercial bindery work, publications, and books. 2 lectures, 1 laboratory.</td>
</tr>
<tr>
<td>Pr 201</td>
<td>Theory of Color (3)</td>
<td></td>
<td>An understanding of the three concepts of color: physical, chemical and psychological. Basic principles involved in ink color mixing, and matching. Printing papers and their characteristics. Printing inks of today and their relationship to paper. The effect of bodies of ink on various types of paper. 3 lectures.</td>
</tr>
<tr>
<td>Pr 221</td>
<td>Intermediate Typography (4)</td>
<td></td>
<td>Proper methods of newspaper display and makeup. Practical application of principles of hand display and layout. Appreciation of importance of markup, designing and preparation of harmonious and balanced ads, with emphasis on good typography. 2 lectures, 2 laboratories. Prerequisite: Pr 121</td>
</tr>
<tr>
<td>Pr 232</td>
<td>Automatic Cylinder Presswork (3)</td>
<td></td>
<td>Operation and maintenance of automatic cylinder presses, with investigation of makeready, ink, paper and other press problems. Study of color and process printing. 1 lecture, 2 laboratories. Prerequisite: Pr 123, 133</td>
</tr>
</tbody>
</table>
Pr 233 Advanced Automatic Cylinder Presswork (3)
Continuation of Pr 232 with emphasis on production, maintenance and color process printing. 1 lecture, 2 laboratories. Prerequisite: Pr 232

Pr 235 Composing Room Maintenance (2)
Introduction to mechanism, maintenance, and repair of composing room equipment. Linotype, Intertype, Elrod, Ludlow, saws, surfacing machines and mitering equipment. Development of maintenance and service charts. Field trips, pictures and study of plant maintenance. 1 lecture, 1 laboratory. Prerequisite: Pr 241

Pr 236 Composing Room Maintenance (2)
Continuation of Pr 235. Advanced methods of maintenance and repair. Lockup, electric and gas pot adjustments, Intertype and Linotype. Study of heating elements and modern heat-control mechanisms. 1 lecture, 1 laboratory. Prerequisite: Pr 235

Pr 240 Additional Printing Laboratory (1-2)
Total credit limited to 4 units, with no more than 2 units in any one quarter.

Pr 241 Composing Machine Operation (3)
Introduction to operation of Intertype and Linotype composing machines. Touch system and proper keyboard operation. Operational adjustments and care of machine. 1 lecture, 2 laboratories. Prerequisite: Pr 121

Pr 242 Composing Machine Operation (3)
Advanced operation and care of composing machines. Use of italics, caps and small caps, ligatures and logotypes. Typography, proper established styles of market ads, classified ads, radio logs. 3 laboratories. Prerequisite: Pr 241

Pr 243 Composing Machine Operation (3)
Bookwork, magazine, and commercial composition. 3 laboratories. Prerequisite: Pr 242

Pr 321 Composing Machine Operation (3)
Advanced mechanism and repair, maintenance and operation of quadders, hydro-quadders and mixers. Field trips, use of visual aids, and lectures by men from industry. 1 lecture, 2 laboratories. Prerequisite: Pr 243

Pr 322, 323 Cold Type Processes (3) (3)
Introduction to Fotosetter, Varityper, Cox Head-Liner, Protype-composing and other reproduction processes. Copyfitting, composing and makeup of newspapers, magazines and catalog advertising using the type-to-negative and paste-up methods. 1 lecture, 2 laboratories. Prerequisite: Pr 321

Pr 324 Offset Camera Work (3)
Scaling copy for line and halftone negatives. Functions and operation of process camera. Darkroom techniques, mixing of chemicals, and developing of film. 1 lecture, 2 laboratories. Prerequisite: Jour 221 or equivalent.

Pr 325 Offset Stripping and Platemaking (3)
Stripping, opaquing, and layout of flats. Exposing and developing of various types of plates used in reproduction and offset printing. 1 lecture, 2 laboratories. Prerequisite: Pr 324

Pr 326 Offset Presswork (3)
Operation and maintenance of small offset presses. Study of fountain solutions, offset papers and ink. 1 lecture, 2 laboratories. Prerequisite: Pr 325

Pr 332 Publication Makeup and Markup (3)
Study of styles in advertising and page makeup. Use of markup code systems for markup of ads and commercial work. Practical experience in makeup of newspaper and magazine pages to enhance sales and reader interest. 1 lecture, 2 laboratories. Prerequisite: Pr 221
Pr 341 Composing Machine Maintenance (3)
Machine maintenance, advanced composing machine maintenance. Practice in administering maintenance of composing room equipment. Ordering parts, maintaining inventory. Supervision during actual laboratory sessions. 1 lecture, 2 laboratories. Prerequisite: Pr 321

Pr 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation. Limited to a total of 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

Pr 401 Printing Office Management (3)
Office problems, methods and procedures. Job tickets, time systems, inventory, control, cost accounting, page costs, circulation systems. Correlation of management and production. 3 lectures. Prerequisite: Senior standing.

Pr 411 Printing Estimating (3)
Fundamentals of pricing and estimating. Composition, presswork, binding, paper, ink, halftones, line cuts, electros, lithography. 3 lectures. Prerequisite: Senior standing.

Pr 412, 413 Estimating (1) (1)
Estimating and pricing all types of printing and offset procedures, purchasing, writing instructions, etc. 1 laboratory. Prerequisite: Pr 411

Pr 421, 422, 423 Production Problems (3) (3) (3)
Analysis of methods of coordinating all factors of production. Methods of promoting interdepartmental harmony and understanding. Review of all plant and shop skills. Pr 421, 422: 1 lecture, 2 laboratories. Pr 423: 3 laboratories.

Pr 431 Advanced Typography (3)
Composition and design of letterheads, business cards, invoices, labels, blotters, direct mail advertising, and other representative business forms. Study of color, display and efficiency of office forms. 1 lecture, 2 laboratories. Prerequisite: Senior standing.

Pr 433 Plant Organization and Layout (3)
Planning, designing and layout of printing plant equipment. Proper use of materials and equipment to cut costs and increase production. Emphasis on engineering skills and approach to departmental management and flow of work. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

Pr 434 Advanced Offset Camera Work (3)
Methods of producing separation negatives by using three-color direct and indirect separation method, using opaque copy and color transparencies. 1 lecture, 2 laboratories. Prerequisite: Pr 324

Pr 435 Advanced Offset Presswork (3)
Operation and maintenance of offset presses 14"x20" and over. Importance of proper packings, mounting of plates and blankets, and correct setting of ink and dampener rollers. Running duotones and three-color process to exact register. 1 lecture, 2 laboratories. Prerequisite: Pr 326

Pr 461, 462 Senior Project (2) (2)
Selection and completion of project under a minimum of 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.

Pr 463 Undergraduate Seminar (2)
Senior students become familiar with data gathered by other seniors in preparation of senior project. Each student is required to conduct the seminar class, under supervision of instructor, at least twice during the quarter. Preparation, oral presentation, and discussion by students of technical papers on recent developments in the industry and senior project material. 2 lectures. Prerequisite: Senior standing.
The curriculum of the Technical Arts Department prepares graduates for employment in a broad range of professional positions in industrial management, industrial production, industrial marketing or industrial arts. For those interested in employment in industry the course offerings qualify students for occupations in the mid-ground between engineering and business. For those planning, with a fifth year, to teach the technical subjects of industry there are both broad and specific offerings concerning course content and methods in all the major areas.

Emphasis is placed upon the study of tools, machines, materials, processes and products. Special consideration is given to the industrial application of mathematics, physics and chemistry. Also of major importance is the development of the ability to work with people concerning matters of a technical nature.

Each student gains a substantial general education through courses in the areas of language communication, social sciences, mathematics, physical education and the arts. His ability to communicate in technical areas is further developed through courses in technical writing and technical drawing.

The Technical Arts Department's new facilities provide for instruction and laboratory experiences in drafting, wood technology, electricity, electronics, metal technology, power technology, industrial crafts, and graphic arts.

**CURRICULAR OPTIONS**

**Industrial Sales and Service**

The Industrial Sales and Service option emphasizes preparation for professional positions in the manufacturing and marketing of industrial products. Students selecting management and production aspects of this option obtain positions as plant supervisor, production-control analyst, systems coordinator, materials expeditor, plant and product designer, technical writer, department head, executive trainee, personnel manager, product consultant, manufacturing specialist and training director. Students specializing in the marketing phase of the option are preparing for positions as manufacturers' sales representative, distributors' representative, liaison engineer, sales analyst, and sales manager.

**Industrial Arts**

The Industrial Arts Option is primarily concerned with an analysis of the materials, tools, processes, and occupations for today's industry. A broad base of industrial type experiences is provided. This foundation is supplemented with a specialized concentration in one or preferably two industries. In addition to practical laboratory experiences stressing understanding and skill, the student will develop ability to: (a) identify problems of an industrial education nature, (b) organize and present logical solutions to these problems, (c) effectively stimulate others in improving their understanding and performance in technical matters. Graduates of this option will be prepared for the many positions which require an extensive understanding of industrial manufacturing procedures plus the ability to work well with people as they help these people to become familiar with processes of industry.

Students desiring to complete the major with the industrial arts option should consult their departmental adviser.

With an additional fifth year of appropriate college courses, the student will be qualified to teach industrial arts in junior and senior high schools. Or, after experience in industry, he may qualify for a position of responsibility with in-plant technical training programs.
**Applied Arts Division**

**CURRICULUM IN TECHNICAL ARTS**

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Technical Computation (TA 101)</td>
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<tr>
<td>Introduction to Technical Arts (TA 111)</td>
<td>1</td>
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<tr>
<td>Engineering Drafting (ME 141, 142)</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Shop Processes (AC 141, IE 141)</td>
<td>2</td>
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<tr>
<td>Industrial Wood Processes (TA 125)</td>
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<td>Graphic Arts Processes (TA 127)</td>
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<tr>
<td>Mathematics for Engineers (Math 117)</td>
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<td>Analytic Geometry and Calculus (Math 118)</td>
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<td>Human Relations (IR 118)</td>
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<td>Language Communication (Eng 104, 105)</td>
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<td>Physical Education (PE 141)</td>
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### Sophomore

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<tr>
<td>Industrial Electricity (TA 131, 132)</td>
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<tr>
<td>Industrial Electronics (TA 133)</td>
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<td>Shop Processes (MS 141, 142)</td>
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<td>College Physics (Phys 121, 122, 123)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Art in Industry (Art 255)</td>
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<td>Introduction to Literature (Eng 207)</td>
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<td>Applied Biology (Bio 110)</td>
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<td>Health Education (PE 107)</td>
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<td>Sports Education (PE 241)</td>
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### Junior

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<th>Course</th>
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<tr>
<td>Power Technology (TA 122, 123)</td>
<td>2</td>
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<tr>
<td>Industrial Management (IR 311)</td>
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<tr>
<td>Shop Processes (Weld 141-142)</td>
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<td>Technical Sketching (TA 245)</td>
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<td>Psychology of Business and Industry (Psy 302)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Introduction to Philosophy (Phil 201)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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### Senior

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<th>Course</th>
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<tr>
<td>Mechanical Systems (TA 323)</td>
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<tr>
<td>Modern Industrial Materials (TA 129)</td>
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<td>Technical Writing (Eng 219)</td>
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<td>Senior Project (TA 461, 462)</td>
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<td>Undergraduate Seminar (TA 463)</td>
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<td>Audio Visual Methods (AV 432)</td>
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<td>U.S. in World Affairs (Hist 305)</td>
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<td>Electives and courses to complete major</td>
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<td><strong>Total Credits</strong></td>
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<td>16</td>
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</tbody>
</table>
INDUSTRIAL SALES AND SERVICE OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman
Actg 131-2 Basic Accounting (6)  TA 331-2-3 Electrical Systems (9)
MSM 204 Marketing Principles (3)  IR 312 Industrial Relations (3)
MSM 205 Physical Distribution (3)

Sophomore
Bus 301 Business Law (3)  MSM 405 Sales Management (3)
MSM 304 Marketing Research (3)  TA 321-2 Mechanical Systems (6)
TA 404 Customer Relations (2)
TA 405 Industrial Marketing (2)

Junior

Senior
MSM 405 Sales Management (3)
TA 321-2 Mechanical Systems (6)
TA 404 Customer Relations (2)
TA 405 Industrial Marketing (2)

INDUSTRIAL ARTS OPTION

Students desiring to complete the major with the Industrial Arts Option should consult their departmental adviser.

DESCRIPTIONS OF COURSES IN TECHNICAL ARTS

TA 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.

TA 111 Introduction to Technical Arts (1)
Orientation to the objectives of the Technical Arts Department. Investigation of employment opportunities. Development of techniques useful to the student in his study. 1 lecture.

TA 122, 123 Power Technology (2) (2)
Analysis of internal combustion engines, gas turbines and hydraulic motors. Fuels and lubricants. Energy conversion, power transmission and modern utilization. 1 lecture, 1 laboratory.

TA 125 Industrial Wood Processes (2)
A study of the production and consumption of wood products and related industries: lumbering, milling, paper production. Modern developments and applications. 1 lecture, 1 laboratory.

TA 127 Graphic Arts Processes (2)
An analysis of printing processes, design, layout, composition, presswork, binding, silk screen, block, offset, photography and duplicating processes. 2 laboratories.

TA 129 Modern Industrial Materials (2)
An investigation of the characteristics, applications and limitations of materials of industry including: plastics, glass, ceramics, rubber, leather, textiles, abrasives and adhesives. 1 lecture, 1 laboratory.

TA 131 Industrial Electricity (3)
Theory and application of basic A-C and D-C circuits. Magnetic circuits. Principles of motors and generators; lighting; instruments. 2 lectures, 1 laboratory.

TA 132 Industrial Electricity (3)
Controls and control circuits. Advanced instrument application. Transformers. Lighting and signal systems. 2 lectures, 1 laboratory. Prerequisite: TA 131

TA 133 Industrial Electronics (3)
Electronic components and circuitry. Vacuum tubes and transistors. Amplifiers. Radio and television. Oscilloscopes. 2 lectures, 1 laboratory. Prerequisite: TA 101, TA 131
Applied Arts Division

TA 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, machine shop and bench metal processes to the fabrication of industrial products. 3 activities. Prerequisite: MS 141, 142; Weld 141, 142; AC 141; IE 141

TA 236  Wood Technology (3)
Theory and practice in the care and use of hand and machine tools; production and consumption of wood products; wood classification and preservation. 3 activities.

TA 237  Industrial Arts Crafts (3)
Fundamental operations and materials of the industrial crafts. Art metal, textiles, ceramics, plastics, leather, lapidary. Design and construction of useful articles. Related instruction. 3 activities.

TA 238  Graphic Arts Technology (3)
An introduction to the graphic arts. Design and layout, composition, presswork, binding, silk screen, block, offset lithography, intaglio, duplicating processes. 3 activities.

TA 245  Technical Sketching (2)
Freehand sketching of industrial products using perspective, isometric oblique and orthographic projection. Shading. Basic design. 2 laboratories. Prerequisite: ME 142

TA 321  Mechanical Systems (3)
Case study of engineering fundamentals from an application point of view. Strength of materials, thermodynamics, fluid mechanics, heat transfer and kinematics. 2 lectures, 1 laboratory. Prerequisite: Math 118, Phys 122, TA 123

TA 322  Mechanical Systems (3)
Case study of various component systems from an application point of view. Steam systems, air conditioning and refrigeration systems, pneumatic and hydraulic systems, servomechanisms, piping systems. 2 lectures, 1 laboratory. Prerequisite: TA 321

TA 323  Mechanical Systems (3)
Case study of industrial manufacturing processes from an operational and service engineering viewpoint. Materials handling techniques. Production equipment and systems. 2 lectures, 1 laboratory.

TA 324  Modern Industrial Finishes (2)
Characteristics and applications of finishes to modern industrial products. Brushing, dipping, spraying, baking, plating, etching. 2 laboratories.

TA 325  Home Mechanics (2)
Selection, care and application of common tools and processes to repair and maintain household appliances and furnishings. 1 lecture, 1 laboratory. (Designed for home economics students, open to others as an elective.)

TA 330  Principles and Practices of Industrial Arts (5)
Techniques and procedures for teaching industrial arts; observations in neighboring schools; survey of methods applicable to teaching drafting, crafts, wood, metal, electricity-electronics, graphic arts, power mechanics and general shop; shop organization; evaluation; preparation for practice teaching. 5 activities. Prerequisite: Ed 312

TA 331  Electrical Systems (3)
Advanced study of electrical applications. Power generation and distribution. Applications of motors, motive power, electrical installations. 2 lectures, 1 laboratory. Prerequisite: TA 132
TA 332 Electrical Systems (3)
Electrical elements in heating and air conditioning. Industrial applications of power supplies, oscillators and amplifiers. Communication systems. 2 lectures, 1 laboratory. Prerequisite: TA 133, TA 331

TA 333 Electrical Systems (3)
Fundamentals of control systems, analog computers, electronic data processing machines and digital control of machines. Emphasis on applications. 2 lectures, 1 laboratory. Prerequisite: TA 332

TA 341 Metalsmithing—Jewelry (2)
Fundamental processes of jewelry making, cutting, bending, forming, soldering, surface enrichment, stone cutting. Design and construction of representative models. 2 laboratories.

TA 342 Art Metal (2)
Instruction and practice in designing, planning, cutting, forming, joining, tooling, enameling and decorating aluminum, brass, copper, pewter and steel to produce artistic metal articles. 2 laboratories.

TA 343 General Metals (2)
Applications of the various metal fabrication processes to typical construction problems. Design and construction of instructional aids suitable for the secondary school industrial arts program. 2 laboratories.

TA 344 Technical Drawing (2)
Practice in the complete description of industrial articles through the graphic "language of industry." Applications of sketching, lettering, instrument drawing, reproduction processes; preparation of working drawings and specifications for industrial articles. 2 laboratories. Prerequisite: TA 245

TA 346 Industrial Arts Design (2)
Applications of design principles to the various materials and processes of industry; development of a creative, problem-solving approach to design as it applies to the teaching of industrial arts. 2 laboratories. Prerequisite: Art 255

TA 347, 348 Industrial Arts Crafts (2) (2)
Design and construction of useful articles utilizing wood, art metal, ceramics, textiles, plastic, leather, reed, and other craft materials. Study of related processes and products. 2 laboratories. Prerequisite: TA 237, Art 255

TA 349 Ceramics (2)
Introduction to ceramic materials and processes; design, slip, slab and coil forming, surface enrichment, glazing and forming; related instruction, industrial applications. 2 laboratories.

TA 354 Machine Wood Technology (3)
Basic principles in safe and efficient care and use of power woodworking machinery. 3 laboratories. Prerequisite: TA 236

TA 355 Furniture Design and Construction (3)
Application of design principles; selection of suitable wood and finish; application of modern production processes. 3 laboratories. Prerequisites: TA 354, Art 255

TA 356 Building Construction Techniques (3)
Examination of modern materials and construction methods as applied to home building; mass-production, custom-building and prefabrication. Field study of representative projects; laboratory experience in framing and basic processes. 3 laboratories. Prerequisite: TA 236
TA 357, 358, 359 Graphic Arts (3)
Advanced investigation of the broad area of graphic arts, including hand and machine composition, presswork, intaglio, offset lithography, silk screen, block printing, binding, photography, platemaking, spirit and stencil duplicating; related instruction on paper, inks, design. 3 laboratories. Prerequisite: TA 238

TA 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with a maximum of 2 units in any one quarter. 1 or 2 laboratories.

TA 401 Curriculum and Methods (2)
Underlying philosophy and practices in the preparation of courses of study and other instructional materials for industrial arts courses. 2 lectures. Prerequisite: TA 330

TA 404 Customer Relations (2)
Customer contacts; personal relationships, ethics, legal relationships, service contracts, communication channels. 2 lectures.

TA 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.

TA 422, 423 Construction Equipment (2) (2)
Analysis of major types of construction equipment from a practical marketing viewpoint. Contract specifications, estimating, basic processes utilizing construction equipment, selection of appropriate equipment and equipment operation and maintenance. 1 laboratory, 1 activity. Prerequisite: TA 122, 123, 131

TA 441 Metal Production Processes (2)
Study of mass-production techniques; design, production planning, tolerances, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial arts metal courses. 2 laboratories. Prerequisite: TA 330

TA 446 Wood Production Processes (2)
Study of mass-production techniques; design, production planning, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial arts wood courses. 2 laboratories. Prerequisite: TA 330

TA 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Project results are presented in a formal report. Minimum 120 hours total time.

TA 463 Undergraduate Seminar (2)
Preparation, oral presentation and discussion by students of professional papers on technical arts. 2 lectures.
Modern journalism places a premium on specialists who have acquired familiarity with a specific field in addition to basic professional training. This college has trained "specialized journalists" exclusively. The Journalism Department offers a program leading to the bachelor of science degree in journalism with concentrations in different occupational areas of journalism—agricultural, community, industrial, and home economics.

All journalism majors must complete the basic curriculum which deals with fundamental journalistic aspects and supplementary courses in arts and sciences. Each major also must complete a certain number of required and elective courses in his particular field of concentration.

Regardless of concentration all journalism majors will be expected to serve as staff members on the school publications and news media and on journalism field teams. In addition to the 198 units required for a degree, the journalism major must complete an eight weeks' noncredit internship in a publishing, radio, advertising, public relations, business or industrial organization under an approved and supervised program. Such internships will take place normally during summers. Credit toward the internship requirement may be granted for journalism field team participation.

Enrollment in journalism courses is open to qualified students of all other departments who wish to gain skills in the techniques and methods of advertising, public relations, publicity, publications, and photography.

**OCCUPATIONAL OBJECTIVES IN JOURNALISM**

**Agricultural Journalism:** Farm or farm-city careers in reporting, editing, radio and television news; publication production; advertising copywriting, layout, selling; public relations and publicity; photography; information specialist.

**Community Journalism:** Community newspaper operation and production; suburban news, advertising and business operation with emphasis on management and ownership; printing and publishing of small daily, weekly and semi-weekly publication; community radio station operation and management.

**Business and Industrial Journalism:** Editorial, advertising and promotion employment on trade and business publications and house organs; sales promotion, industrial relations and industrial publicity; production and management of specialized industrial publications and printing; internal and external public relations programming; trade association secretary-manager positions; advertising agency and radio advertising with industrial emphasis; photography and graphic arts for industrial operations.

**Home Economics Journalism:** Women's publications; editorial, advertising and promotion; consumer organization public relations and sales promotion; community publications staff writing and editing with emphasis on women's home and family features; public utilities promotion and advertising of interest to homemaking and family interest groups; photography and radio newscasting designed especially for women's special activities.
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<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>Journalism Orientation (Jour 118)</td>
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<td>Language Communication (Eng 104, 105)</td>
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<td>Introduction to Literature (Eng 207)</td>
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<td>Mathematics (Math 102, 103 or Math 100, 200)</td>
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<td>General Biology (Bio 101, 102, 103 or equiv.)</td>
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<td>Elementary Photography (Jour 221)</td>
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<td>Photojournalism (Jour 222)</td>
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<td>Sophomore</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Sports Education (PE 241)</td>
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<td>American Literature (Eng 311, 312, 313)</td>
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<tr>
<td>General Physical Science (PSc 101, 102, 103 or equiv.)</td>
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<td>Introductory Journalism (Jour 201)</td>
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<td>News Writing (Jour 202)</td>
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<td>Reporting I (Jour 203)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>Health Education (PE 107)</td>
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<td>Graphic Arts Processes (TA 127)</td>
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<td>Reporting II (Jour 304)</td>
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<td>Advanced Copy Editing (Jour 334)</td>
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<td>Editorial and Feature Writing (Jour 302)</td>
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<td>Radio News (Jour 333)</td>
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<td>Senior Project (Jour 461)</td>
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<td>State and Local Government (Pol Sc 401)</td>
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<td>Undergraduate Seminar (Jour 463)</td>
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<td>Newspaper and Magazine Advertising (Jour 421)</td>
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<td>Newspaper Management (Jour 403)</td>
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<td>Applied Journalism Techniques (Jour 451, 452, 453)</td>
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† Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

* The student may substitute Jour 303, 412, or 432 for Jour 427.

§ A minimum of 45 elective units must be chosen in a field of concentration with the approval of the adviser.
**DESCRIPTIONS OF COURSES IN TECHNICAL JOURNALISM**

**Jour 118 Journalism Orientation (2)**
Explores career opportunities in Technical Journalism, examines specialized communications problems, introduces organizations and methods of campus communication media offering opportunities for applied training, familiarizes student with campus community. 1 lecture, 1 laboratory.

**Jour 201 Introductory Journalism (3)**
Survey of historical and current influences in the development of today's journalism media. 3 lectures.

**Jour 202 News Writing (3)**
Study of principles used in the reporting of news events for the press. Study and practice in writing various types of news stories, including interviews and speeches. Ethical and legal problems in gathering and reporting news. Some attention to news features. 3 lectures.

**Jour 203 Reporting I (3)**
Daily coverage of actual news events related to the campus community, and further exploration of techniques and problems in reporting. Some special assignments involving off-campus events. 1 lecture, 2 laboratories. Prerequisite: Jour 202 and proficiency in typing.

**Jour 221 Elementary Photography (3)**
For those who have had limited experience in photography. Picture-taking techniques and darkroom practices. 2 lectures, 1 laboratory.

**Jour 222 Photojournalism (3)**
Advanced photographic techniques and darkroom procedures for producing illustrations for newspapers and magazines. 2 lectures, 1 laboratory. Prerequisite: Jour 221 or equivalent experience.

**Jour 233 Editing and Copy Desk (3)**
Copy desk work, head writing, page makeup, special rewrite and editing problems, handling of correspondents, etc. 2 lectures, 1 two-hour activity period. Prerequisite: Jour 202.

**Jour 251 Journalism Practice—Reporting and Editing (1-2)**
Credit arranged for students holding editorial or other positions on college publications or securing other similar supervised experience. 1-2 laboratories. Prerequisite: Journalism major or instructor's permission. Total credit limited to 6 units.

**Jour 254 Journalism Practice—Photography (1-2)**
Credit arranged for students holding editorial or other positions on college publications or securing other similar supervised experience. 1-2 laboratories. Prerequisite: Jour 222 or equivalent experience. Total credit limited to 6 units.

**Jour 302 Editorial Feature Writing (3)**
Editorial and feature writing techniques. Study of markets for nonfiction articles; practice in gathering material and preparation of articles for technical and trade journals, and other media. 3 lectures. Prerequisite: Jour 233.

**Jour 303 Illustrated Features (3)**
Emphasis on market research and preparation of illustrated articles for publication. Close attention to techniques of combining photographs and text in article preparation and marketing. 3 lectures. Prerequisite: Jour 233.

**Jour 304 Reporting II (3)**
Additional experience, on a more advanced level, in daily coverage of news events related to the campus community. Special assignments for off-campus news media. More thorough examination of press law. 1 lecture, 2 laboratories. Prerequisite: Jour 203.
Jour 323 Free-lance Photography (3)
Technique of the picture story, magazine article illustration, livestock and industrial equipment photography, advertising photography. 1 lecture, 2 two-hour laboratories. Prerequisite: Jour 222

Jour 333 Radio News Writing (3)
Radio news programming, fundamentals of writing and editing for radio. Community interviews. Copy preparation. Commercial tie-ins. 1 lecture, 1 two-hour laboratory, and assigned field work. Prerequisite: Sp 201

Jour 334 Advanced Copy Editing (3)
Daily experience and responsibilities in editing and rewriting news and feature stories, and editorial writing for campus news media. Practical application of headline writing and page makeup principles. 1 lecture, 2 laboratories. Prerequisite: Jour 202, 233

Jour 351 Journalism Practice—Advertising (2)
Credit arranged for students holding editorial or other positions on college publications or securing other similar supervised experience. 2 laboratories. Total credit limited to 6 units.

Jour 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation. Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 activity periods.

Jour 403 Newspaper Management (3)
Management problems in operation of smaller daily or weekly newspapers. Analysis of newspaper organization, circulation principles and practices, production problems, and industrial relations. 3 lectures. Prerequisite: Jour 233, 421

Jour 405 Publicity Methods (3)
Study and application of publicity planning and methods used by business firms, associations and similar groups. 2 lectures, 1 laboratory. Prerequisite: Jour 302

Jour 412 Public Relations (3)
Methods employed in dissemination of public information by business, agricultural, industrial, educational, and government organizations. Survey of media used, techniques commonly employed, formation and measurement of public opinion. 3 lectures.

Jour 421 Newspaper and Magazine Advertising (3)
Advertising psychology, advertising salesmanship, copy, layout, and production. Required for majors; recommended for students from other departments needing to know how to advertise and merchandise their own or others' products or services. 2 lectures, 1 two-hour laboratory. Prerequisite: Jour 233 or instructor's permission.

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. Emphasis on local newspaper and trade magazine advertising. 1 lecture, 1 laboratory. Prerequisite: Jour 421

Jour 427 Magazine Production (3)
Organization, editing and production of magazines, with special emphasis on trade, association and company publications. 2 lectures, 1 two-hour activity period. Prerequisite: Jour 302

Jour 432 Radio Advertising (3)
Survey of radio research methods, listenership studies, national networks, local chains, independents, production and transcription services, contracts, writing of commercials, spot announcements. 2 lectures, 1 two-hour laboratory. Prerequisite: Jour 421
Jour 451, 452, 453  Applied Journalism Techniques (2) (2) (2)

Application of advanced journalism techniques in reporting, editing, public relations, photojournalism, radio or advertising, combined with supervisory responsibilities for campus news media. 2 laboratories. Prerequisite: Senior status in Technical Journalism.

Jour 461, 462  Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

Jour 463  Undergraduate Seminar (2)

Discussion of major political, economic, and social developments that have public interest and significance to the journalist. Ethics of the press, its importance and responsibilities. Correlation of the various phases of journalism and relation of these to other fields. 2 lectures.

Jour 502  Supervision of School Publications (3)

Study of types of school publications with emphasis on student publications including the newspaper and yearbook; methods for organizing and supervising staff; production; integrating publication into the public relations picture; financing. 1 lecture, 2 laboratories. Prerequisite: Instructor's approval.
THE APPLIED SCIENCES DIVISION
Student Using Scintillation Counter in Nuclear Physics Laboratory

Statistics Laboratory, Mathematics Department

Biological Sciences Class
THE APPLIED SCIENCES DIVISION

The Applied Sciences Division has four primary functions:

1. To provide courses for students working toward the Bachelor of Science Degree with majors in the Applied Sciences.
2. To provide for all students of the college courses designed to assist in meeting the requirements in general education so that every graduate will be prepared to take an active part as a citizen and productive member of the State, nation, and world.
3. To provide for students in Agriculture, Applied Arts, Applied Sciences and Engineering those courses closely related to and directly complementing their areas of specialization.
4. To provide natural and social sciences courses for students preparing to teach at the elementary and/or secondary school level.

In close cooperation with the Applied Arts Division the faculty of the Applied Sciences Division recommends candidates for the California Standard Teaching Credential with majors in Biological Sciences, Chemistry, Mathematics, Physics, and Social Sciences. Teaching minors are offered in Botany, Chemistry, History, Mathematics, Physics, Political Science, and Zoology. Students may concentrate in Biological Sciences, Mathematics, Physical Sciences or Social Sciences as a part of the requirements for the Master of Arts in Education degree.

Curricula offered by the Applied Sciences Division leading to the Bachelor of Science degree are: Biochemistry, Biological Sciences, Chemistry, Mathematics, Physics and Social Sciences. The Division also offers, through the department of Military Science, the elective Reserve Officer Training Corps (ROTC) program to majors in all divisions of the College. The College Library is a part of the Applied Sciences Division for administrative purposes, but serves the entire College.
BIOLOGICAL SCIENCES DEPARTMENT
Department Head, Glenn A. Noble

The department offers a complete program of college work, leading to the bachelor of science degree in biological sciences. Majors in the department may concentrate in botany, bacteriology, zoology, or other areas while developing a broad background in biology. Students majoring in agriculture are given the necessary bacteriological, botanical, and zoological background to enable them to appreciate and understand the basic biological principles underlying the more applied courses, and more advanced work is offered in certain technical fields such as plant pathology, and dairy bacteriology. Courses are offered to fulfill the general education requirement in biology for other Applied Arts and Applied Sciences departments and for engineers.

Graduates in the biological sciences generally enter the fields of college and high school teaching, medical and biological laboratory technology, public health and sanitation, fish and game management, state and national park service and pest control. In addition, graduates have entered veterinary, medical, dental, and graduate schools.

The department laboratories are supplied with the most modern equipment. Classes are organized to make biology as meaningful as possible. San Luis Obispo County offers unusual opportunities for the study of a wide variety of plants and animals since in this county are found flora and fauna representative of both Southern and Northern California.

CURRICULUM IN BIOLOGICAL SCIENCES

**Freshman**

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<th>Course</th>
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<td>General Botany (Bot 121, 122, 123) or General Zoology</td>
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<tr>
<td>General Inorganic Chemistry (Chem 324, 325)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<td>Analytic Geometry &amp; Calculus (Math 118)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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**Sophomore**

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<td>General Zoology (Zoo 131, 132, 133) or General Botany</td>
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<td>General Bacteriology (Bact 221)</td>
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<td>General Psychology (Psy 202)</td>
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<td>General Entomology (Ent 126)</td>
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<td>College Physics (Phys 121, 122, 123)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Sports Education (PE 241)</td>
<td>16 1/2</td>
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* Of the total elective units a minimum of 29 shall be in a field of concentration in the Biological Sciences with the approval of the adviser. At least 18 of these 29 units must be in 300 or 400 courses.

1 Chem 321, 322, and 323 will substitute for Chem 324 and 325
2 Math 102 and 103 or Math 100 and 200 will substitute.
3 Phys 131, 132, 133 will substitute.
### Junior

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<td>Ecology (Bio 325)</td>
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<tr>
<td>Genetics (Bio 303)</td>
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<tr>
<td>Advanced Composition (Eng 314)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Literature</td>
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<td>Literature or Philosophy</td>
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<td>Literature or Fine and Practical Arts</td>
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<td>Senior Project (Bio 461)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Undergraduate Seminar (Bio 463)</td>
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<td>Agricultural Biochemistry (Chem 328)</td>
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<td>Growth of American Democracy (Hist 304)</td>
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<td>U.S. in World Affairs (Hist 305)</td>
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### DESCRIPTIONS OF COURSES IN 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 or Bot 121 or Zoo 131

**Bact 222 Dairy Bacteriology (4)**

Advanced course for practical work demonstrating the domestic and industrial importance of micro-organisms 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

**Bact 333 Industrial Microbiology (3)**

Sanitary and industrial applications of microbiology stressing food, dairy, water, air and sewage; practical aspects of environmental sanitation emphasized. 2 lectures, 1 laboratory. Prerequisite: Bio 110 or Bact 221

**Bact 342 Sanitary Inspection and Control (2)**

Domestic and commercial contamination, epidemiology, stressing practical applications of hygienic practices and methods of correcting and eliminating health hazards. 2 laboratories. Prerequisite: Bact 221 or Bact 333

**Bact 423 Public Health Microbiology (4)**

Detailed study of pathogenic yeasts, molds, viruses, and bacteria in relation to public health. 2 lectures, 2 laboratories. Prerequisite: Bact 221

**Bact 590 Seminar in Bacteriology (1-3)**

Problems and topics in advanced bacteriology selected according to the interest and needs of the students enrolled. 1 to 3 units in one quarter, maximum of 6 units. Prerequisite: Graduate standing and evidence of satisfactory preparation in bacteriology.

* Of the total elective units a minimum of 29 shall be chosen in a field of concentration in the Biological Sciences with the approval of the adviser. At least 18 of these 29 must be in 300 or 400 courses.
DESCRIPTIONS OF COURSES IN BIOLOGY

Bio 100 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)
Characteristics of living things; cellular composition and organization; functional approach to organ systems of man. 3 lectures. Not open to students who have taken Bot 121 or Zoo 131

Bio 102 General Biology (3)
Endocrine system; reproduction; heredity and environment; social implications of biological principles. 3 lectures. Prerequisite: Bio 101

Bio 103 General Biology (3)
Disease; plants, animals and man; balance of nature, conservation of resources; history of man. 3 lectures. Prerequisite: Bio 102

Bio 110 Applied Biology (3)
Biology of man with applications to engineering and industry. 3 lectures. Not open to students who have taken Bot 121 or Zoo 131

Bio 127 Natural History (3)
Scope of natural history; formation and identification of features in the physical environment; natural history survey of the plant kingdom. 1 lecture, 2 laboratories.

Bio 128 Natural History (3)
Natural history survey of the animal kingdom; field study and identification of environmental features and organisms. 1 lecture, 2 laboratories. Prerequisite: Bio 127

Bio 129 Natural History (3)
Principles of field biology and ecology; laboratory and field study of wildflowers, insects and field biology; California natural history. 1 lecture, 2 laboratories. Prerequisite: Bio 128

Bio 142 Biological Techniques (3)
Preparation of plant and animal specimens for display or study purposes. 1 lecture, 2 laboratories. Prerequisite: Bot 121, Zoo 131 or Bio 129

Bio 303 Genetics (3)
Principles of heredity and variation. 3 lectures. Prerequisite: one quarter of college biology and two quarters of college mathematics.

Bio 304 Advanced Genetics (2)
Recent advances in genetics and cytogenetics. 2 lectures. Prerequisite: Bio 303

Bio 313 Radiation Biology (2)
Effect of radiation on plant and animal tissues. Includes use of nonionizing and ionizing radiations, isotopes and health hazards. 2 lectures. Prerequisite: Phys 123, or Phys 133 and one of the following or its equivalent: Bio 101, 110, Bot 121, Zoo 131

Bio 315 Evolution (2)
Modern concepts of evolutionary mechanisms. 2 lectures. Prerequisite: Bio 303

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: Bot 122 and Zoo 132
Bio 328 Marine Biology (3)
Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 1 laboratory. Prerequisite: Zoo 133 and Bot 122 or consent of instructor.

Bio 331 Biosystematics (3)
Major principles of classification, taxonomy, speciation, and nomenclature. Designed primarily for biology majors. Term report required. 2 lectures, 1 laboratory. Prerequisite: Ent 126, Bot 123 or Zoo 133

Bio 343 Radiation Laboratory Techniques (2)
Demonstrations and exercises in the use of radioisotopes and the operation of radiation detecting instruments. 2 laboratories. Prerequisite: Bio 313 (may be taken concurrently).

Bio 344 Advanced Genetics Laboratory (2)
Laboratory techniques in genetics. 2 laboratories. Prerequisite: Bio 304 (may be taken concurrently).

Bio 400 Special Problems (1-2)
Individual or group investigations for advanced students. Total credit limited to 4 units with no more than 2 units in any one quarter.

Bio 423 General Cytology (4)
Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: Bio 303 and either Zoo 133 or Bot 123

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: Bio 462

Bio 521 Curriculum and Methods in Teaching Biological Sciences (3)
Objectives, content, techniques, materials, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Graduate standing; evidence of satisfactory preparation in biology, botany and zoology.

Bio 590 Seminar in Biology (1-3)
Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. 1 to 3 units in one quarter, maximum of 6 units. 1-3 lectures. Prerequisite: Graduate standing and evidence of satisfactory preparation in biology.

DESCRIPTIONS OF COURSES IN 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 General Botany (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

9—14191
Bot 223  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. 3 lectures, 1 laboratory. Prerequisite: Bot 122 or Bot 123

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 123

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 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 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 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 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 the instructor.

Bot 590  Seminar in Botany (1-3)  Problems and topics in advanced botany selected according to the interest and needs of the students enrolled. 1-3 units in one quarter, maximum of 6 units. 1-3 lectures. Prerequisite: Graduate standing and evidence of satisfactory preparation in botany.

DESCRIPTIONS OF COURSES IN CONSERVATION

Cons 311  Introductory Conservation (2)  Basic principles and problems of conservation. Organization, control and interrelationships of government and private agencies dealing with the conservation of natural resources. 2 lectures. Prerequisite: Junior standing.

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. 3 lectures, 1 laboratory. Prerequisite: Bio 325 or SS 223 or Zoo 226

Cons 433  Inland Fisheries (4)  Habitat improvement, harvesting and propagation of trout and warmwater fish. Identification and life histories of important western species. Farm pond management. 3 lectures, 1 laboratory. Prerequisite: Bio 325 or SS 223
DESCRIPTIONS OF COURSES IN ENTOMOLOGY

Ent 126 General Entomology (4)
Introduction to the study of insects. Structure, major orders and families of insects, life histories, economic importance and control. Insect collection required. 3 lectures, 1 laboratory.

Ent 332 Economic Entomology (3)
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. 1 lecture, 2 laboratories. Prerequisite: Zoo 132 or Bot 122; Ent 126; Chem 326 or permission of instructor.

Ent 590 Seminar in Entomology (1-3)
Problems and topics in advanced entomology selected according to the interest and needs of the students enrolled. 1-3 units in one quarter, maximum of 6 units. 1-3 lectures. Prerequisite: Graduate standing and evidence of satisfactory preparation in entomology.

DESCRIPTIONS OF COURSES IN ZOOLOGY

Zoo 122 Elementary Human Physiology (4)
Basic patterns of body functions and structure. For Home Economics majors. 3 lectures, 1 laboratory.

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 animals. 2 lectures, 2 laboratories. Prerequisite: Zoo 132

Zoo 237, 238, 239 Human Anatomy and Physiology (3) (3) (3)
Morphology of man, with laboratory dissection of the cat. Functions of the various organ systems of man with appropriate laboratory experiments. 2 lectures, 1 laboratory. Prerequisite: Zoo 132 and a knowledge of 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 321 Mammalogy (4)
Identification, life histories, and economic importance of mammals, with special reference to California species. 2 lectures, 2 laboratories. Prerequisite: Zoo 132 or Bio 129

Zoo 326 Comparative Anatomy of the Vertebrates (5)
Comparative structure of vertebrate organ systems. 3 lectures, 2 laboratories. Prerequisite Zoo 132. Recommended: Zoo 303 and Zoo 353

Zoo 329 Vertebrate Field Zoology (4)
Identification and natural history of terrestrial vertebrates, with emphasis on field study of local forms. 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

### Zoo 353 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 422 Histology and Microtechnique (5)
Microscopic anatomy of principal tissues and organs of vertebrates with an introduction to histological techniques. 2 lectures, 3 laboratories. Prerequisite: Zoo 132. Recommended: Zoo 303 and Zoo 353

### 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: permission of the instructor.

### Zoo 428 Hematology (3)
Microscopic and chemical examination of blood. Designed for preparing laboratory technologists. 2 lectures, 1 laboratory. Prerequisite: permission of the instructor. Recommended: Zoo 426

### Zoo 590 Seminar in Zoology (1-3)
Problems and topics in advanced zoology selected according to the interest and needs of the students enrolled. 1 to 3 units in one quarter, maximum of 6 units. 1-3 lectures. Prerequisite: Graduate standing and evidence of satisfactory preparation in zoology.
Applied Sciences Division

MATHEMATICS DEPARTMENT

Department Head, Milo E. Whitson

Olive M. Andersen
William D. Bandes
Thomas G. Burgess
William O. Buschman
Francis V. Catalina
Mansfield L. Clinnick
James T. Culbertson
Charles A. Elston
Oswald J. Falkenstern
Kenneth G. Fuller
John R. Gilbert

Y. Leon Maksoudian
Charles J. Hanks
Charles T. Haskell
Wilbur Hogan
Gilbert L. Homfeld
W. Boyd Judd
Elmo A. Keller
George C. Laumann
John J. Lowry
Puey-Chong Lum
George R. Mach

The objectives of the Mathematics Department are to offer courses needed in
the other departments for the purpose of developing vocational proficiency; to
contribute to the general education of all students; to prepare secondary and
elementary mathematics teachers who know the meaning and significance of the
mathematics they will teach; and to prepare applied mathematicians for industrial
and civil service employment.

It is recommended that the high school student planning a mathematics major
include in his high school program at least three years of mathematics and two
years of science.

Mathematics Placement Tests are given to all entering students to determine
their relative facility and competence in mathematics. The results of these tests
are used to help in placing the students in courses where they can most likely
succeed. Students in mathematics, physical sciences, and engineering who have
had adequate preparation will normally begin their college mathematics work in
Math 117 or Math 118. Students majoring in Business Administration will usually
begin with Math 108. Other students of the Applied Sciences and Applied Arts
Divisions will start with Math 100 or Math 200. Students majoring in the Agri-
culture Division will normally begin with Math 102.

CURRICULUM IN MATHEMATICS

<table>
<thead>
<tr>
<th>Courses</th>
<th>F</th>
<th>W</th>
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<tbody>
<tr>
<td>Mathematics for Engineers (Math 117)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<tr>
<td>General Physics (Phys 131, 132)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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<tr>
<td>Electives</td>
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16½ 16½ 16½

Sophomore

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<tr>
<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<tr>
<td>Programming for Digital Computers (Math 221 or 304)</td>
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<tr>
<td>Differential Equations (Math 316)</td>
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<tr>
<td>Mathematics of Statistics (Math 321)</td>
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<tr>
<td>† Approved Mathematics Courses</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<td>General Physics (Phys 133)</td>
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<td>General Chemistry (Chem 321)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Sports Education (PE 241)</td>
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<tr>
<td>Electives</td>
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</tbody>
</table>

16½ 16½ 16½

1 Fifteen of these elective units must be selected from approved skills courses. Teacher candidates
should use several of their electives toward their teaching minor.

† To be selected with approval of adviser and to include at least 6 units of applied mathematics.
### Junior

<table>
<thead>
<tr>
<th>Course Description</th>
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<tbody>
<tr>
<td><strong>Differential Equations (Math 317)</strong></td>
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<tr>
<td><strong>Advanced Engineering Mathematics (Math 318, 319)</strong></td>
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<td><strong>Numerical Analysis (Math 332)</strong></td>
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<tr>
<td>* Literature</td>
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<td>* Biological Sciences</td>
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### Senior

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<tbody>
<tr>
<td>Senior Project (Math 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Math 463)</td>
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<td><strong>Vector Analysis (Math 404)</strong></td>
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<td><strong>Advanced Calculus or Statistics (Math 412 or 322)</strong></td>
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<td>† Approved Mathematics Courses</td>
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</tr>
<tr>
<td>* Literature or Philosophy</td>
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<td>American Government (Pol Sc 301)</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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<tr>
<td>U. S. in World Affairs (Hist 305)</td>
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<tr>
<td>* Social Sciences</td>
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<tr>
<td>Electives</td>
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<td><strong>Total</strong></td>
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</tbody>
</table>

### Descriptions of Courses in Mathematics

**Math 1 Preparatory Mathematics (4)**

Decimal system and systems of other bases; four fundamental processes with integers, fractions, signed numbers, and algebraic symbols; use of exponents, simple linear equations with applications in rate, levers, mixture, ratio, proportion, percentage, Pythagorean theorem, and square root. 4 lectures.

**Math 7 Preparatory Algebra (5)**

Signed numbers, linear equations, literal equations, formula evaluation, functional relationships, graphing linear and quadratic equations, factoring algebraic functions, fractional equations. 5 lectures. Prerequisite: Satisfactory score on placement examination.

**Math 100 Basic Mathematics for General Education (3)**

The number system of mathematics through irrational, imaginary, and complex numbers, and illustrations of uses of bases other than 10; geometry of mathematics, including basic triangle relationships, coordinates, distance in a plane, and inequalities, trigonometric functions and identities and relationship of complex numbers to trigonometric functions. 3 lectures. Prerequisite: Satisfactory score on placement test or Math 1.

**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, concrete, lumber and proportions. 3 lectures. Prerequisite: Math 1 or satisfactory score on placement examination.

**Math 103 Agricultural Mathematics (3)**

Use of exponents, logarithms and elementary slide rule, trigonometric functions; basic land descriptions; work, horsepower and efficiency, pressure; standard deviation. Not open to students with credit in Math 117. 3 lectures. Prerequisite: Math 102

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* To be selected from the General Education list.

** Teacher candidates should substitute the following: Theory of Equations, Math 307; Modern Algebra, Math 381, 382; Secondary School Mathematics, Math 402, 403; College Geometry, Math 442.

† To be selected with approval of adviser and to include at least 6 units of applied mathematics.
Math 104 Slide Rule (1)
Operation of the slide rule and methods of computation used in engineering. 1 lecture. Prerequisite: Math 108, 115 or 117

Math 108 Mathematics of Business (3)
Algebra of business; simple interest principles, methods and applications; bank, cash and trade discounts; exponents, radicals, logarithms, equations and basic algebraic operations. 3 lectures. Prerequisite: Math 1 or satisfactory score on Math Placement Test.

Math 109 Mathematics of Business (4)
Compound interest principles, methods and applications; simple, due, deferred and ordinary general annuities; amortization of debts and sinking funds; perpetuities and capitalized costs. 4 lectures. Prerequisite: Math 108

Math 114 College Algebra for Agriculture (3)
An abridged course covering selected topics from algebra designed for those students who are majoring in mechanized agriculture, and biochemistry. Not open to students with credit in Math 117. 3 lectures. Prerequisite: Math 103

Math 115 Trigonometry for Agriculture (3)
An abridged course covering selected topics from trigonometry designed for those students who are majoring in mechanized agriculture and biochemistry. 3 lectures. Prerequisite: Math 114

Math 117 Mathematics for Engineers (5)
An integrated course in college algebra and trigonometry covering function concept 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, binomial formula, and complex numbers. 5 lectures. Prerequisite: Math 7 or satisfactory score on placement examination.

Math 118 Analytic Geometry and Calculus (5)
Introductory course in analytic geometry and calculus. Topics include: rectangular co-ordinates, geometry of the straight line and conic sections, functions, limits, continuity, differentiation of algebraic functions, differentials, parametric equations, maxima and minima, and simple applications of the derivative. 5 lectures. Prerequisite: Math 117, Math 115 or satisfactory score on placement examination.

Math 121 Mathematics for Elementary Teachers I (4)
Number concepts; systems of notation; number systems and their properties; the four fundamental operations with whole numbers and common fractions, including work in various number bases. Achievement and remedial tests are used. 3 lectures and 2 hours of activity periods.

Math 122 Mathematics for Elementary Teachers II (4)
Decimal fractions, including work in other number bases; the meaning of percent and its applications; universal arithmetic and formulas; elements of sets and modular arithmetic; origin and usage of measurement; field and laboratory work in estimation and measurement of lengths and areas. 3 lectures and 2 hours of activity periods. Prerequisite: Math 121 or instructor's permission.

Math 200 Basic Mathematics for General Education (3)
Symbolic logic; functions through higher degree equations; binomial theorem; logarithms; sequences; continuity and discontinuity, and limits; analytic geometry through the conics. 3 lectures. Prerequisite: Math 100

Math 201 Analytic Geometry and Calculus (3)
Continuation of Math 118. Curve tracing, mean value theorem, definite integrals of algebraic functions with applications to area, volume, work, and centroids, differentiation of transcendental functions with such applications as Newton's Method for solving equations and L'Hospital's Rule. 3 lectures. Prerequisite: Math 118
Math 202 Analytic Geometry and Calculus (3)
Continuation of Math 201. Polar co-ordinates, integration by formula, trigonometric substitution, and parts. Applications in area, volume, work, and centroids. 3 lectures. Prerequisite: Math 201

Math 203 Analytic Geometry and Calculus (3)
Continuation of Math 202. Integration by partial fractions, approximate integration, length of arc, introductory topics in solid analytic geometry, partial differentiation, double integrals, centroids, moments, and infinite series. 3 lectures. Prerequisite: Math 202

Math 207 Mathematics for Business Decisions (3)
Introduction to the mathematics used in analysis and decision-making processes of business management. Language and algebra of sets, inequations, equations and relations, algebra of vectors and matrices, linear programming, and probability. 3 lectures. Prerequisite: Math 109 or equivalent.

Math 211 Descriptive Statistics (3)
Graphical representation of statistical data, calculation and uses of various averages, measures of variability, elementary probability and the normal curve, sampling and estimation. 3 lectures. Prerequisite: Math 103 or instructor's permission.

Math 212 Statistical Methods (3)
Tests of hypotheses, sampling theory, linear regression, linear correlation, index numbers, time-series analysis, quality control, and analysis of variance. 2 lectures, 1 activity period. Prerequisite: Math 211 or instructor's permission.

Math 217 Mathematics of Digital Computers (3)
Algorithms and iterative computer methods; neurons and nerve nets; permutations, combinations and probability; number systems and traditional logic. 3 lectures. Prerequisite: Satisfactory grade in any degree mathematics course.

Math 218 Mathematics of Digital Computers (3)
Types of relations; Boolean algebra of classes and proportions; deductive systems; simplification of Boolean functions and reduction to normal forms. 3 lectures. Prerequisite: Math 217

Math 219 Mathematics of Digital Computers (3)
Boolean algebra of switching circuits, linear programming, nerve net theory, introduction to information theory. 3 lectures. Prerequisite: Math 218

Math 221 Programming of Digital Computers (3)
Coding of general purpose and special purpose digital computers; preparation of programs for general purpose computers; sub-routines. 3 lectures.

Math 250 Programming and Operating the Small Digital Computer (1)

Math 251 Programming of Data Processing Equipment (1)
Programming of problems in business, engineering, agriculture and mathematics. Use of a general purpose compiler. One activity period. Prerequisite: Sophomore standing.

Math 300 Basic Mathematics for General Education (3)
Three-dimensional geometry; polar coordinates and parameters; the derivative; integration; transcendental functions and series. 3 lectures. Prerequisite: Math 200
Math 302 Intuitive Geometry and Measurement (4)
Field and laboratory approach to measurement of angles, volumes, liquid and dry measures; weight and time; the metric system; scale drawings; the study of plane figures and geometrical solids; graphing of equations and inequalities in coordinate geometry; intuitive geometry; inductive and deductive reasoning; indirect proof. 3 lectures and 2 hours of activity periods. Prerequisite: Math 122 or instructor's permission.

Math 304 Digital Computer Programming (3)
Programming of a large modern digital computer. Assembly program usage, subroutine libraries, timing problems. Problems in data processing. 2 lectures, 1 two-hour activity period. Prerequisite: Math 221 or consent of instructor.

Math 307 Introduction to Theory of Equations (3)
Complex numbers, general theorems on algebraic equations, solutions of the general cubic, methods of solution of algebraic equations. An introduction to matrices and determinants. 3 lectures. Prerequisite: Math 201

Math 311 Introduction to Linear Algebra (3)
Vector spaces, algebra of vectors, linear independence, subspaces, determinant theory. 3 lectures. Prerequisite: Math 203

Math 312 Linear Algebra (3)
Linear transformations and matrices, rank, dimension, inverse, eigenvalues and eigenvectors, applications. 3 lectures. Prerequisite: Math 311

Math 316 Differential Equations (3)
An introduction to first order differential equations and simple linear equations with constant coefficients. Applications to dynamics, electric circuits, and heat flow. 3 lectures. Prerequisite: Math 203

Math 317 Differential Equations (2)
Linear differential equations with constant coefficients. Operational methods including an introduction to the Laplace transform and their applications. 2 lectures. Prerequisite: Math 316

Math 318 Advanced Engineering Mathematics (3)
Theory and application of power series, Laplace transforms, Bessel functions, series solutions of ordinary differential equations, Gamma functions. 3 lectures. Prerequisite: Math 317

Math 319 Advanced Engineering Mathematics (3)
Elliptic integrals, differentiation under the integral sign, Fourier series, harmonic analysis and solution of partial differential equations. 3 lectures. Prerequisite: Math 317

Math 321 Mathematics of Statistics (3)
Frequency distribution, the median and other quantiles, the mean and other averages, standard deviation and other measures of dispersion, moments, skewness and kurtosis, the normal curve, permutations, and combinations, probability, the binomial and Poisson distributions. 3 lectures. Prerequisite: Math 201 (may be taken concurrently).

Math 322 Mathematics of Statistics (3)
Continuation of Math 321. Approximation of the binomial by a normal distribution, test of hypotheses, significance of an observed proportion and of a difference between two sample proportions, significance of means and variances, student's t-distribution, the F-distribution, analysis of variance, Chi-square test of hypotheses, linear and exponential trends, linear regression and correlation. 3 lectures. Prerequisite: Math 321
Math 323 Mathematics of Statistics (3)
Continuation of Math 322. Additional topics in analysis of variance and in correlation, multiple regression and correlation, analysis of covariance, and non-parametric statistics. 3 lectures. Prerequisite: Math 322

Math 332 Introduction to Numerical Methods (3)
Numerical solution of algebraic and transcendental equations and systems of equations, finite differences, interpolation, numerical integration, and numerical solution of ordinary differential equations. 3 lectures. Prerequisite: Math 316 or consent of instructor.

Math 381 Modern Algebra (3)
An introductory course in the concepts of modern algebra. It includes fundamental definitions, sets, mapping, relations defined on a set. Binary operations, groups, rings, integral domains and fields. 3 lectures. Prerequisite: Math 307 or permission of the instructor.

Math 382 Modern Algebra (3)
Extends the concepts of modern algebra to polynomials and vectors. It includes the fundamental concept of polynomials as applicable to groups, rings and integral domains, polynomials over a field, vectors and vector spaces. 3 lectures. Prerequisite: Math 381

Math 400 Topics in Applied Mathematics (1-2)
Individual or group investigations. Total credit limited to 4 units. 1 or 2 lecture-conferences. Prerequisite: Permission of the department head.

Math 402 Secondary School Mathematics (3)
A study of the mathematical content of junior high school courses with particular emphasis on the new curricular materials that are being developed and introduced into the schools. Suitable for both upper grade and junior high school teachers. 3 lectures. Prerequisite: At least junior standing.

Math 403 Secondary School Mathematics (3)
A study of the mathematical content of the senior high school courses, with particular emphasis on the new curricular materials that are being developed and introduced into the senior high school courses. 3 lectures. Prerequisite: At least junior standing.

Math 404 Vector Analysis (3)
Algebra of free vectors with applications. Differential and integral calculus of vectors. Development of theory and application of vector operators. 3 lectures. Prerequisite: Math 316

Math 405 Vector Analysis (3)
General coordinates, differential geometry and harmonic functions. Applications to physical fields: electrostatics, magnetism and electrodynamics. Fundamentals of tensor method. 3 lectures. Prerequisite: Math 404

Math 408 Functions of a Complex Variable (2)
Fundamental properties of a complex variable. Conformal mapping and its applications to heat transfer, electric potential theory, and hydrostatics. 2 lectures. Prerequisite: Math 317

Math 409 Functions of a Complex Variable (2)
Analysis of two-dimensional fields by use of conformal mapping and contour integration. 2 lectures. Prerequisite: Math 408

Math 412 Advanced Calculus (3)
Real numbers system, Dedekind cuts, sequences, limits, continuity, derivatives and differentials, Riemann integration. 3 lectures. Prerequisite: Math 203
Math 413 Advanced Calculus (3)
Functions of several variables and partial differentiation, uniform continuity, theory of integration. Stieltjes integrals, infinite series, sequences of functions and uniform convergence. 3 lectures. Prerequisite: Math 412

Math 432 Numerical Analysis (3)
Continuation and expansion of Math 332. Methods for the solution of equations and systems of equations, interpolation, the solution of ordinary and partial differential equations; emphasis on methods suitable for the application of electronic digital computers. 2 lectures, one activity period. Prerequisite: Math 332

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 rational of the fundamental operations with the rational numbers; 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 304 and Math 122 or permission of the instructor.

Math 441 Theory of Numbers (3)
Properties of numbers. Euclid's Algorithm, greatest common divisor, least common multiple, indeterminate equations, prime numbers, congruences; emphasis toward the teaching of secondary mathematics. 3 lectures. Prerequisite: At least junior standing and Math 118 or instructor's permission.

Math 442 College Geometry (3)
Geometric constructions, similar and homothetic figures, properties of the triangle, harmonic division, properties of circles. This course is designed to extend the background of the teacher in the field of synthetic Euclidean geometry. 3 lectures. Prerequisite: At least junior standing.

Math 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

Math 463 Undergraduate Seminar (2)
Reports and discussions by students through seminar methods, based on their senior projects and on other topics in mathematics which are of interest to them. Two activity periods.

Math 501 Foundations of Geometry (3)
Logical foundations of geometry, coordinate systems, synthetic and analytic projective geometry, fundamental concepts of Euclidean geometry, Non-Euclidean geometries. This course is designed to broaden the student's perspective in the field of geometry. 3 lectures. Prerequisite: 9 units college mathematics.

Math 505 Introduction to Sets (3)
An introduction to the basic ideas and concepts of sets. Functions and graphs are studied from the set point of view, applications of these concepts to other areas; important for understanding of the new elementary and secondary mathematics curricular materials; for both elementary and secondary teachers. 3 lectures. Prerequisite: Graduate standing or the consent of the instructor.

Math 506 Structure of Arithmetic and Algebra (3)
The formation and development of integers and real numbers, development of properties and laws of integers and rational numbers; operations with numbers developed by the axiomatic method. Suitable for upper grade, and junior and senior high teachers. 3 lectures. Prerequisite: Graduate standing or consent of the instructor.
Math 509 Development of Mathematics (3)
Correlation between the development of our society and the development of mathematics. Designed to aid the teacher of secondary mathematics to enrich the courses taught in secondary schools. 3 lectures. Prerequisite: graduate standing.

Math 510 Survey of Modern Mathematics (3)
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. 3 lectures. Prerequisite: Graduate standing or instructor's approval.

Math 521 Curriculum and Methods in Mathematics (3)
General aims, objectives and methods of effective teaching of mathematics in the secondary schools. The traditional secondary curriculum will be compared with new trends and developments. 3 lectures. Prerequisite: Graduate standing.

Math 580 Seminar (1-2-3)
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, 2, or 3 lectures. Prerequisite: Instructor's approval.

DESCRIPTIONS OF COURSES IN PHILOSOPHY

Phil 201 Introduction to Philosophy (3)
The relationships among the sciences and between science and philosophy. The principal types of philosophy in their relation to science. How philosophy has influenced the growth of ideas in the sciences and how present scientific developments are related to basic philosophical ideas. 3 lectures.

Phil 202 Logic (3)
Brief survey of classical deductive logic. Methods of clear thinking in English prose sentences. Modern symbolic logic including Boolean algebra of classes and propositions, with applications. 3 lectures.

Phil 204 Ethics (3)
Implications of ethics and ethical systems; scientific inquiry into the principles of the morality of human actions. 3 lectures. Prerequisite: Phil 201 or instructor's permission.
The purpose of the Reserve Officers' Training Corps (ROTC) is the training of students for officer positions in the Army in times of national emergency. Successful completion of the four-year course entitles the student to a commission as a second lieutenant, United States Army Reserve, under terms of the Reserve Forces Act of 1955. In addition, the program provides for selection of distinguished military graduates of college ROTC units for direct appointment as second lieutenants in the Regular Army or in the Marine Corps. The four-year program is divided into the basic course and the advanced course, each course covering a two-year period. As in any other course, credits count toward college graduation. To be eligible for enrollment in ROTC a student must be:

a. A male citizen of the United States.

b. Qualified for appointment as a second lieutenant prior to reaching 28 years of age.

c. A regularly enrolled student of this institution.

d. Physically, mentally, and morally qualified.

ARMS, EQUIPMENT, AND UNIFORMS

The United States Government furnishes arms, equipment, uniforms, and textbooks for cadets. This property belongs to the United States Government and must be returned at the end of each school year or when a student ceases to be enrolled in the course.

DEFERMENTS

Under the provisions of the Universal Military Training and Service Act—June 1951 (Public Law 51, 82d Congress), regularly enrolled ROTC students may be deferred from induction through the Selective Service System if qualified and selected for deferment. No student is deferred automatically by virtue of the fact that he is enrolled as an ROTC student, but must meet all of the following special criteria:

1. Have sufficient time remaining as a college student to permit completion of the advanced ROTC course.

2. Meet the physical, mental, moral, and leadership qualities required for a commission in the Army.

3. Meet the College's minimum academic standards.

4. Apply to the head of the Department of Military Science for deferment.

5. Sign a deferment agreement.

In signing a deferment agreement, a student pledges that he will complete the four-year ROTC course, that he will accept a commission if offered, that he will serve not less than two years if called and that he will remain a member of the Regular or Reserve component of the Army until the sixth anniversary of the receipt of his commission unless sooner terminated. If his services are not needed by the Army, he may be called for a six-month period. In this case, he then agrees to remain a member of the Regular or Reserve component of the Army until the eighth anniversary of his commission.

Generally, students may apply for deferment, if otherwise eligible, during any quarter of college studies except the first quarter of the freshman year. Deferment agreements remain in effect until the student ceases to be qualified, completes his College program, or withdraws from the College.
The purpose of the basic course is to qualify the student as a citizen-leader in peace or in war. Enrollment in the basic course is elective. After a student has enrolled in the course, he must complete the two-year sequence of this course in consecutive years. Completion of the course (two years) becomes a prerequisite for graduation, unless relieved by regulations prescribed by the Secretary of the Army. ROTC is scheduled so as not to interfere with student participation in sports or other college activities.

Veterans with one year or more of active service in the armed forces may, upon proper certification, receive credit for the basic course and enroll directly in the advanced course. Veterans with less service will receive such credit as the president of the college and the head of the Department of Military Science may jointly determine.

A student with previous training in ROTC, either junior or senior division, at another institution may be granted advanced standing in the course. A student who desires credit for previous ROTC training should secure from the high school or other institution concerned a transcript of such training. This transcript should be presented by the student at the time he enrolls or be filed with the College registrar.

The major purpose of the advanced course is to produce college-trained junior officers to meet active Army and reserve requirements. Advanced course students are eligible to selection for a commission in the Regular Army through the Distinguished Military Graduate program upon fulfilling the following requirements: outstanding qualities of military leadership, high moral character, and definite aptitudes for the military service; distinguished academic accomplishment or demonstrated leadership in recognized campus activities; successful completion of all military science subjects or their equivalents; and completion of the full four-year curriculum at the College with a degree.

Enrollment in the advanced course is limited to selected students who are less than 26 years of age, have passed a qualifying examination, and have completed the basic course or received credit therefor. Upon entering the advanced course, a student must sign an agreement with the United States Government that he will complete the advanced course, that he will attend ROTC summer camp, that he will accept an appointment as a second lieutenant in the Army of the United States and that he will serve on active duty for two years or for six months, as ordered. When a student enrolls in the advanced course, completion thereof becomes a prerequisite for graduation from the college unless relieved by competent authority. The government agrees to defer the student from induction into the armed services until the student should normally graduate. In addition the student receives a monthly subsistence allowance during the course, plus pay at summer camp.

Army regulations permit a student to substitute related academic course work for one quarter of each of the last two years of the ROTC program. These academic courses are in place of the regular MSc winter quarter requirements during each of the junior and senior year sequences.

Advanced course students are required to attend one course of summer camp training for six weeks during the summer vacation period normally following completion of the first year of the advanced course. The United States Government furnishes uniforms, equipment, transportation expenses to and from camp, pays the student while at camp at the rate of pay of an Army private. Five quarter units of credit are granted for successful completion of this camp.
DESCRIPTIONS OF COURSES IN MILITARY SCIENCE

* MSc 101-102-103 (MS I) Basic Course (1) (1) (1)
  Organization of the Army and ROTC; individual weapons and marksmanship; United States Army and national security; leadership, drill and command (drill). Academic subject in related fields. May be substituted for PE 141. One lecture. One hour and 20 minutes field instruction.

MSc 122 Rifle Marksmanship and Hunter Safety (2)
  Fundamentals of marksmanship; state fire arms laws; state game laws; hunting practices and hunter safety; range safety and firing (laboratory). One lecture and one two-hour laboratory. Prerequisite: None. Open to all male and female Cal Poly students and in no way obligates the student to the ROTC program.

* MSc 201-202-203 (MS II) Basic Course (2) (2) (2)
  American Military History; map and aerial photograph reading; introduction to basic tactics and techniques; leadership, drill and command (drill). May be substituted for PE 241. Two lectures. One hour and 20 minutes drill instruction. Prerequisite: MS I or equivalent.

* MSc 301, 303 (MS III) Advanced Course (3) (3)
  Leadership; military teaching principles; branches of the Army; small unit tactics and communication; leadership, drill and command (drill). Academic subjects in related fields. 4 lectures. One hour and 20 minutes field instruction required during fall, winter, and spring quarters. Prerequisite: MS II or equivalent.

* MSc 400 ROTC Summer Camp (5)
  A concentrated laboratory course in military science and tactics. An application of the military theory learned in the classroom. Technical operation, maintenance, and tactical employment of the latest weapons and equipment. Required for a six-week period during the period normally following completion of MSc 303.

* MSc 401, 403 (MS IV) Advanced Course (3) (3)
  Operations; logistics; Army administration and military justice; role of the U. S. in world affairs; service orientation; leadership, drill and command (drill). Academic subjects in related fields. Four lectures. One hour and 20 minutes field instruction required during fall, winter, and spring quarters. Prerequisite: MS III or equivalent.

* Enrollment in the basic course or in the advanced course makes completion thereof a prerequisite to graduation from the College unless the student is sooner discharged by appropriate authority.
The Physical Sciences Department serves all divisions of the College by offering courses which help provide scientific explanations for work taken by students in the Agricultural, Engineering, Applied Arts, and Applied Sciences Divisions. The department also contributes to the general education of all students by giving them a thorough foundation in the method and factual content of the physical sciences and the roles which they play in society. The three major curricula of the department lead to the bachelor of science degree in physics, chemistry, or biochemistry.

The occupational objectives of the curricula in physics and chemistry are to qualify students for entry at the bachelor's level into positions in governmental service and industry and to help prepare secondary teachers of the physical sciences.

Graduate courses are offered which help to complete the requirements for the teaching credential and for the master of arts degree in education with a field of concentration in the physical sciences.

It is suggested that the high school student planning to major in physics or chemistry include in his high school program as much as possible of the following: three semesters of algebra, one of trigonometry, two of geometry, two of physics, and two of chemistry.

Proper selection of electives in the curriculum in biochemistry permits specialization in nutritional, food, feed, pesticide, fertilizer or clinical chemistry. Students find employment in the laboratories of those companies devoted to the processing of food products and the production of agricultural and pharmaceutical chemicals. Positions for which the student may qualify include vitamin assay biochemist, food and drug chemist, feed analyst, meat technologist, fertilizer chemist, insecticide residue analyst, and public health chemist. It is recommended that the high school student planning to follow the curriculum in biochemistry include two semesters of chemistry in his high school program.

Students enrolling in General Chemistry or General Inorganic Chemistry are required to pass a placement test, or Chem 4, or the equivalent.

### CURRICULUM IN PHYSICS

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<th>Course</th>
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<tr>
<td>Biological Sciences (Bio 101, 110, Bot 121, or Zoo 131)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Shop Processes (MS 141, 142)</td>
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<td>Health Education (PE 107)</td>
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<td>Physical Education (PE 141)</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<td>General Chemistry (Chem 321, 322, 323)</td>
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<td>General Physics (Phys 131, 132)</td>
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| Total | 16½ | 17½ | 16½ |
## Applied Sciences Division

### Sophomore

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<th>Course</th>
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<td>Principles of Economics (Ec 201)</td>
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<td>Sports Education (PE 241)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Differential Equations (Math 316)</td>
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<td>Laboratory Glassblowing (Chem 342)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<td>General Physics (Phys 133)</td>
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<td>Engineering Statics (Phys 201)</td>
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<td>Engineering Dynamics (Phys 202)</td>
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<td>Introduction to Optics and Atomic Physics (Phys 211)</td>
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<td>Sound (Phys 212)</td>
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<td>Electrical Circuits (Phys 206)</td>
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<td>Electrical Measurements Laboratory (Phys 256, 257)</td>
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### Junior

1. Literature

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<tr>
<td>Vector Analysis (Math 404, 405)</td>
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<td>Physical Chemistry (Chem 432)</td>
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<td>Heat (Phys 301)</td>
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<td>Analytic Mechanics (Phys 303)</td>
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<td>Electricity and Magnetism (Phys 306)</td>
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<td>Atomic Physics (Phys 401)</td>
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<td>Atomic Physics Laboratory (Phys 441)</td>
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<td>Nuclear Physics (Phys 402, 403)</td>
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2. Literature, Philosophy, or Arts

### Senior

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<th>Course</th>
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<td>American Government (Pol Sc 301)</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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<td>U. S. In World Affairs (Hist 305)</td>
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<tr>
<td>1 Social Sciences</td>
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<tr>
<td>2 Literature, Philosophy, or Arts</td>
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<td>Electricity and Magnetism (Phys 307)</td>
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<td>Quantum Mechanics (Phys 405)</td>
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<td>Senior Project (Phys 461, 462)</td>
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1. To be selected from the General Education list.
2. To be selected from the General Education list with not more than two units from fine and practical arts.
# California State Polytechnic College

## CURRICULUM IN CHEMISTRY

### Freshman

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<tr>
<th>Course</th>
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<tr>
<td>General Chemistry (Chem 321, 322, 323, or Chem 324, 325, 323)</td>
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<td>General Chemistry Laboratory (Chem 143)</td>
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<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Mathematics for Engineers (Math 117)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<td>Health Education (PE 107)</td>
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<tr>
<td>Biological Sciences (Bio 101, 110, Bot 121 or Zoo 131)</td>
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<td>Electives</td>
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Total: 15½ 16½ 17½

### Sophomore

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<th>Course</th>
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<td>Quantitative Analysis (Chem 331, 332)</td>
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<td>Organic Chemistry (Chem 326)</td>
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<td>Laboratory Glassblowing (Chem 342)</td>
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<td>General Physics (Phys 131, 132, 133)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Shop Processes (MS 141, 142)</td>
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<td>1 Literature</td>
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<td>Sports Education (PE 241)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>Report Writing (Eng 301)</td>
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Total: 17½ 16½ 17½

### Junior

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<th>Course</th>
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<td>Organic Chemistry (Chem 327)</td>
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<td>Agricultural Biochemistry (Chem 328)</td>
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<td>Physical Chemistry (Chem 432, 433)</td>
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<td>Qualitative Organic Analysis (Chem 343)</td>
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<td>Introduction to Optics and Atomic Physics (Phys 211)</td>
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<td>Light (Phys 223)</td>
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<td>General Psychology (Psy 202)</td>
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<td>American Government (Pol Sc 301)</td>
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Total: 16 17 16

### Senior

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<th>Course</th>
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<tr>
<td>Advanced Organic Chemistry (Chem 403)</td>
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</tr>
<tr>
<td>Senior Project (Chem 461, 462)</td>
<td>2</td>
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</tr>
<tr>
<td>Undergraduate Seminar (Chem 463)</td>
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</tr>
<tr>
<td>Advanced Physical Chemistry (Chem 437)</td>
<td>4</td>
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<tr>
<td>Special Problems for Advanced Undergraduates (Chem 400)</td>
<td>2</td>
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<tr>
<td>Atomic Physics (Phys 401)</td>
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</tr>
<tr>
<td>Atomic Physics Laboratory (Phys 441)</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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<tr>
<td>U.S. in World Affairs (Hist 305)</td>
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Total: 16 16 16

1. To be selected from the General Education list.
2. To be selected from the General Education list with not more than two units from fine and practical arts.
## CURRICULUM IN BIOCHEMISTRY

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>General Chemistry (Chem 324, 325, 323, or 321, 322, 323)</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Shop Processes (MS 141, 142)</td>
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<tr>
<td>Language Communications (Eng 104, 105, 106)</td>
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<td>Agricultural Mathematics (Math 102, 103)</td>
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<tr>
<td>Physical Education (PE 141)</td>
<td>1/2</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>General Zoology (Zoo 131) or General Botany (Bot 121)</td>
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<tr>
<td>Electives</td>
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### Sophomore

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<th>Course</th>
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<tr>
<td>Quantitative Analysis (Chem 331, 332)</td>
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<tr>
<td>Organic Chemistry (Chem 326)</td>
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<tr>
<td>Physics (Phys 121, 122 or 131, 132)</td>
<td>4</td>
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<tr>
<td>Laboratory Glassblowing (Chem 342)</td>
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<tr>
<td>Mathematics (Math 114, 115, 118)</td>
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<td>Engineering Drafting (ME 141)</td>
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<td>Sports Education (PE 241)</td>
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<td>Approved Courses</td>
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### Junior

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<tbody>
<tr>
<td>Physics (Phys 123 or 133)</td>
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<tr>
<td>Agricultural Biochemistry (Chem 328, 329)</td>
<td>4</td>
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<tr>
<td>Organic Chemistry (Chem 327)</td>
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<td>Physical Chemistry (Chem 432, 433)</td>
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<td>Qualitative Organic Analysis (Chem 343)</td>
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<td>Report Writing (Eng 301)</td>
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<td>Principles of Economics (Ec 201)</td>
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<td>American Government (Pol Sc 301)</td>
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<td>Social Sciences</td>
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<td>Literature</td>
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<td>General Psychology (Psy 202)</td>
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<td>Electives</td>
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### Senior

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<tr>
<td>Advanced Agricultural Biochemistry (Chem 434)</td>
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<td>Food Analysis (Chem 435)</td>
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<td>Agricultural Chemicals (Chem 436)</td>
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<td>Senior Project (Chem 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Chem 463)</td>
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<tr>
<td>Special Problems for Advanced Undergraduates (Chem 400)</td>
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<tr>
<td>Literature or Philosophy</td>
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<tr>
<td>Growth of American Democracy (Hist 304)</td>
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<td>U.S. in World Affairs (Hist 305)</td>
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<td>Electives</td>
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<tr>
<td><strong>Total</strong></td>
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1 Math 117 may be substituted for Math 114, 115.
2 Literature, Philosophy, or Arts from General Education list will substitute.
3 Ten units to be selected with approval of adviser.
4 Agricultural Mechanics (AE 121) will substitute.
5 To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN CHEMISTRY

Chem 4 Preparatory Chemistry (3)
For students whose background is deficient in chemistry and mathematics. Symbols, nomenclature, molecular theory, problems dealing with the metric system, density, formulas, percentage composition, and chemical equations. 3 lectures. Prerequisite: Math 103 or equivalent.

Chem 143 General Chemistry Laboratory (1)
Additional laboratory to be taken with Chem 323. Includes semi-micro qualitative study of the nonmetals. 1 laboratory. Prerequisite: Chem 322 or 325

Chem 321 General Chemistry (4)
General principles including atomic structure, acids and bases, ions, solutions, types of chemical reactions, properties of gases, liquids, and solids, and elementary equilibria. For engineering, physics, chemistry, and mathematics majors. 3 lectures, 1 laboratory. Prerequisite: Chem 4 or the passing of a placement test.

Chem 322 General Chemistry (4)
The common nonmetals and their compounds, properties of metals, metallurgy, electrochemistry and corrosion, nuclear chemistry. 3 lectures, 1 laboratory. Prerequisite: Chem 321

Chem 323 General Chemistry (4)
The compounds of the metals, ionic equilibria, an introduction to the carbon compounds emphasizing petroleum products and synthetic polymers. Semi-micro qualitative analysis in the laboratory. 3 lectures, 1 laboratory. Prerequisite: Chem 322 or 325

Chem 324 General Inorganic Chemistry (4)
Fundamental principles including atomic structure, periodic classification of the elements, valence, equations, gas laws, electrochemistry, and chemical calculations. For agricultural and biochemistry majors. 3 lectures, 1 laboratory. Prerequisite: Chem 4 or the passing of a placement test.

Chem 325 General Inorganic Chemistry (4)
Basic principles of equilibrium, nuclear processes, solutions, and colloids. Properties of the common elements and their compounds with applications to agriculture. 3 lectures, 1 laboratory. Prerequisite: Chem 324

Chem 326 Organic Chemistry (4)
The fundamental concepts of organic chemistry with applications to agricultural and industrial processes. 3 lectures, 1 laboratory. Prerequisite: Chem 322 or 325

Chem 327 Organic Chemistry (5)
A more complete study of the types of organic compounds along with some reaction mechanisms. The laboratory is largely organic preparation. 3 lectures, 2 laboratories. Prerequisite: Chem 326

Chem 328 Agricultural 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 chemistry involved in the use, analysis and manufacture of feeds, foods and other agricultural products. 3 lectures, 1 laboratory. Prerequisite: Chem 326

Chem 329 Agricultural Biochemistry (4)
Chemistry and physiology of the vitamins as applied to their function in plant and animal metabolism. Manufacture, stabilization, effect of food processing operations, laboratory animal technique, feed and food enrichment. 3 lectures, 1 laboratory. Prerequisite: Chem 328
Chem 331  Quantitative Analysis (4)
Volumetric industrial analytical procedures based upon precipitometry, redoximetry, alkalimetry, and acidimetry. Laboratory work is the focal point, with class discussion supplying supporting theory. Emphasis on applications of chemical equilibrium and methods of problem solving. 2 lectures, 2 laboratories. Prerequisite: Chem 323 or 332

Chem 332  Quantitative Analysis (4)
Principles of gravimetric analysis applied to industrial methods with emphasis on metals. Basic theory of laboratory work in class discussion. Properties of precipitates and colloids as applied to analytical procedures. Topics in instrumental analysis. 2 lectures, 2 laboratories. Prerequisite: Chem 331

Chem 342  Laboratory Glassblowing (1)
Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: Chem 321 or 324

Chem 343  Qualitative Organic Analysis (4)
The experimental determination of the identity of organic compounds. Special reference to those compounds used in agriculture. 1 lecture, 3 laboratories. Prerequisite: Chem 327

Chem 400  Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. Individual or group investigations for advanced students. 1 or 2 laboratories.

Chem 403  Advanced Organic Chemistry (3)
A detailed study of the mechanisms of organic reactions and related topics. 3 lectures. Prerequisite: Chem 327, 432

Chem 432  Physical Chemistry (4)
Physical properties and molecular constitution of gases, liquids and solids. Elementary chemical thermodynamics and thermochemistry. Homogeneous and heterogeneous equilibria; phase rule; solutions, distillation theory. 3 lectures, 1 laboratory. Prerequisite: Phys 123 or 133, Chem 323, Math 118

Chem 433  Physical Chemistry (4)
Colloids; electrochemistry, applications to analytical procedures. Reaction rates, applications to commercial processes; physical properties and molecular structure; photochemistry; radioactivity. 3 lectures, 1 laboratory. Prerequisite: Chem 432

Chem 434  Advanced Agricultural Biochemistry (4)
Intermediary metabolism in plants and animals. Special reference to enzymes, hormones, pigments, biological oxidation and their relationship to agricultural production. 3 lectures, 1 laboratory. Prerequisite: Chem 329

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: Chem 328

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: Chem 328

Chem 437  Advanced Physical Chemistry (4)
Selected topics in advanced physical chemistry. 3 lectures, 1 laboratory. Prerequisites: Chem 433, Math 203, Phys 211
Chem 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

Chem 463 Undergraduate Seminar (2)
A study of current developments in chemistry and a discussion of periodical literature at an appropriate level. 2 meetings.

Chem 513 Advanced Inorganic Chemistry (3)
Selected topics concerning the structures and related properties of inorganic compounds. 3 lectures. Prerequisite: Graduate standing.

DESCRIPTIONS OF COURSES IN PHYSICS

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 109 or 118.

Phys 121, 122, 123 College Physics (4) (4) (4)
Fundamental principles of mechanics; hydraulics, heat, light and sound; magnetostatics, electrostatics, and current electricity. 3 lectures, 1 recitation, 1 laboratory. Prerequisite: Math 108, 114, 117, or 200

Phys 131 General Physics (4)
Fundamental principles of mechanics. Vectors, statics, uniform motion, accelerated motion, work and energy, rotational motion, elasticity, impact, and harmonic motion. 3 lectures, 1 recitation, 1 laboratory. Prerequisite: Concurrent Math 118, or higher.

Phys 132 General Physics (4)
Fundamental principles of hydraulics, heat, sound, and light. Fluids at rest and in motion, temperature, expansion, quantity of heat, heat transfer, thermodynamics, thermal properties of matter, wave motion, vibrating bodies, acoustical phenomena, nature and propagation of light, geometric optics. 3 lectures, 1 recitation, 1 laboratory. Prerequisite: Phys 131

Phys 133 General Physics (4)
Fundamental principles of magnetostatics, electrostatics, and current electricity. Coulomb's law, electric field, potential properties of dielectrics, capacitance, Ohm's law, electrochemistry, magnetism and magnetic fields, measuring instruments, magnetic field of a moving charge, induced e.m.f., a.c. circuits, electronics. 3 lectures, 1 recitation, 1 laboratory. Prerequisite: Phys 132, Math 201

Phys 201 Engineering Statics (3)
Resolution and composition of forces. Equilibrium. Stresses and reactions in simple structures. Friction. Centroids and centers of gravity. Moments of inertia of area and mass. Introduction to dynamics. 3 lectures. Prerequisite: Phys 131, Math 201

Phys 202 Engineering Dynamics (3)
Rectilinear and curvilinear motion and the forces involved. Rotation. Work, energy, and power. Plane motion. Impulse, momentum, and impact. 3 lectures. Prerequisite: Phys 201

Phys 206 Electrical Circuits (3)
Direct current, alternating current, and electronic circuits. 3 lectures. Prerequisite: Phys 133, Math 202
Phys 211  Introduction to Optics and Atomic Physics (4)
Fundamental principles of optics and atomic physics. Basic geometric optics, optical instruments, introductory physical optics. Introduction to the fundamental particles of matter, interpretation of spectra, relativity, atomic structure. 4 lectures. Prerequisite: Phys 133 or equivalent.

Phys 212  Sound (3)
Vibratory motion. Transverse waves, longitudinal waves, vibration of bars. Velocity of sound, vibrating air columns. Interference. Intensity and intensity level, loudness and loudness level. 3 lectures. Prerequisite: Phys 133

Phys 223  Physical Optics (4)
The physical nature of light. Diffraction, interference and polarization phenomena. Resolving power of optical instruments. Radiation and color. 3 lectures, 1 laboratory. Prerequisite: Phys 211, Math 203

Phys 256, 257  Electrical Measurements Laboratory (1) (1)
Electrical measurements using direct current, alternating current, and electronic methods. 1 laboratory. Prerequisite or concurrent: Phys 206

Phys 301  Heat (3)

Phys 303  Analytic Mechanics (3)
Statics and dynamics of particles and rigid bodies including an introduction to Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: Phys 202, Math 316

Phys 306, 307  Electricity and Magnetism (4) (3)
Electric and magnetic field theory using vector treatment. Electric fields, dielectric materials, magnetic fields, induced emf's and induction, magnetic materials, general field and wave equations, plane electromagnetic waves. 4 lectures, 3 lectures. Prerequisite: Phys 133, Math 404

Phys 400  Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. Individual or group investigations for advanced students. 1 or 2 laboratories.

Phys 401  Atomic Physics (3)
Foundations of atomic theory, atomic structure, electron energy levels, X-rays. Introduction to quantum theory and special relativity. Wave-particle duality. 3 lectures. Prerequisite: Phys 211, Math 203

Phys 402  Introductory Nuclear Physics (3)
Natural and induced radioactivity. Interactions of charged particles and gamma rays in matter. Detection methods and instruments. Neutron production and interactions. 3 lectures. Prerequisite: Phys 401

Phys 403  Nuclear Physics (3)

Phys 405  Quantum Mechanics (3)
The experimental basis of quantum mechanics. The wave equation and interpretation. Solutions for one dimensional problems and the one electron atom. 3 lectures. Prerequisite: Math 316, Phys 401
Phys 406 Solid State Physics (3)
The crystalline structure of solids. Properties of metallic and ionic lattices. Electrical properties of insulators, metals and semi-conductors. 3 lectures. Prerequisite: Phys 405

Phys 412 Solid State Physics for Engineers (3)
Basic quantum mechanics. Atomic structure. Binding and energies of molecules. Electrical, thermal and magnetic properties of solids. Semi-conductors. 3 lectures. Prerequisite: Phys 211, Math 316

Phys 421 Nuclear Reactor Physics (4)
Nuclear fission. Nuclear chain reaction. Neutron diffusion. Thermal reactor critical equation. Time varying system. Reactor control and factors affecting multiplication. 3 lectures, 1 laboratory. Prerequisite: Phys 442, Math 316

Phys 441 Atomic Physics Laboratory (1)
Experimental studies of the properties of electrons and quanta and their interactions with atoms. Experiments include the determination of electron charge and mass, Planck's constant, atomic energy levels and properties of X-rays. 1 laboratory. Prerequisite or concurrent: Phys 401

Phys 442 Introductory Nuclear Physics Laboratory (1)
Techniques of measurement including Geiger, proportional and scintillation counting. Determination of the properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: Phys 402

Phys 443 Nuclear Physics Laboratory (1)
Energy spectra of nuclear particles. Coincidence measurements. Absolute activity determinations and selected specialized techniques. 1 laboratory. Prerequisite or concurrent: Phys 403. Prerequisite: Phys 442

Phys 452 Solid State Physics for Engineers (1)
Selected experiments in solid state physics. 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 441

Phys 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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 463 Undergraduate Seminar (2)
Study of current developments in physics and discussion of periodicals of an appropriate level. 2 meetings.

Phys 501 Selected Topics in Advanced Physics (3)
Electromagnetic theory of radiation, and special theory of relativity. 3 lectures. Prerequisite: Graduate standing.

Phys 502 Nuclear Physics (3)
Instrumentation, methods, and results of experiments. Systematics and theory of nuclear structure. 3 lectures. Prerequisite: Graduate standing.
DESCRIPTIONS OF COURSES IN PHYSICAL SCIENCE

PSc 101 General Physical Science (4)
Introduction to physical phenomena and concepts. The development of a better understanding of man's physical environment. The scientific method of working and thinking. Not to be taken by students who have taken a college course in physics or chemistry. 3 lectures, 1 recitation. Prerequisite: Math 100, 103, 108, or 122.

PSc 102 General Physical Science (4)
Various theories of matter and energy and the principles and laws that describe their behavior and application. Some special knowledge of modern science that will function in a socially desirable manner in the lives of the students. 3 lectures, 1 recitation. Prerequisite: PSc 101.

PSc 103 General Physical Science (4)
A number of recent advances. Objective observation and experimentation in the solution of problems relating to natural phenomena. 3 lectures, 1 recitation or 1 laboratory (alternative to be selected by student's major department). Prerequisite: PSc 102.

PSc 209 Geology (3)
Fundamental geologic processes. General surface features of the earth. Rocks and minerals. 3 lectures.

PSc 216 Elementary Astronomy (3)
Descriptive astronomical properties of the earth, solar system, stars and galaxies. Opportunities for descriptive observations and star identification. Not open to students who have completed or are taking PSc 321. 3 lectures.

PSc 321 General Astronomy (4)
Quantitative and descriptive properties of the earth, solar system, stars and galaxies. Astronomical applications of the laws of the physical sciences. Laboratory periods devoted to observational astronomy and associated techniques. 3 lectures, 1 laboratory. Prerequisite: Phys 132, Math 203; Phys 211 or 223 strongly recommended.

PSc 512 Philosophy of Science (3)
The relationship of philosophy and science. A presentation of problems in the logic of science and in the analysis of the concepts of science. 3 lectures. Prerequisite: Graduate standing.

PSc 52T Curriculum and Methods in the Physical Sciences (3)
Techniques, aims and objectives in the teaching of physics, chemistry, physical science, and general science at the secondary school level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Graduate standing.
The Social Sciences Department serves the four divisions of the College in providing general education for citizenship. In general, the department seeks to provide the student with a better understanding of the society in which he lives; to develop in the student those skills and attitudes which are prerequisites for effective citizenship in democracy; 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.

Graduate courses are offered in the department which will permit the student to qualify for a Master of Arts degree in education with a concentration in the field of the social sciences.

**CURRICULUM IN SOCIAL SCIENCES**

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<tr>
<th>Freshman</th>
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<tr>
<td>Language Communication (Eng 104, 105, 106)</td>
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<td>Public Speaking (Sp 201)</td>
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<td>Health Education (PE 107)</td>
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<td>Basic Mathematics for General Education (Math 100)</td>
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<td>Natural Science</td>
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<td>Introduction to Philosophy (Phil 201)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Economic Problems (Ec 213)</td>
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<td>Sports Education (PE 241)</td>
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<td>Natural Science</td>
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<tr>
<td>Principles of Sociology (Soc 201, 202, 203)</td>
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<tr>
<td>History of the United States (Hist 201, 202, 203)</td>
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<tr>
<td>Principles of Political Science (Pol Sc 201, 202, 203)</td>
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<tr>
<td>Electives</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

* To be selected from the General Education list. Include one sequence course which meets for three quarters with a minimum of 9 units.

* Of the 48 units of electives, 34 will require the approval of the adviser.

* A satisfactory skill in typing is required for graduation. A student who does not type may use two units of elective credit to take Bus 140, 141 to satisfy the requirement.
DESCRIPTION OF COURSE IN 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.

DESCRIPTIONS OF COURSES IN ECONOMICS

Ec 105 Consumer Economics (3)
Consumer-producer relationships, money management, buying methods; investments, insurance, and housing; agencies that help the consumer. 3 lectures.

Ec 201 Principles of Economics (3)
Basic institutional arrangements in the American economy. 3 lectures. Prerequisite: Sophomore standing. Successful completion of freshman English recommended.

Ec 202 Principles of Economics (3)
Introductory analytical economics. Principles and applications in the allocation of scarce resources; the pricing and output problems of the firm; distribution of factor income; and their effects in the national economy. 3 lectures. Prerequisite: Ec 201

Ec 203 Principles of Economics (3)
Application of economic principles to business problems. 3 lectures. Prerequisite: Ec 201, 202

Ec 213 Economic Problems (3)
Specific current problems selected with reference to the needs of the students. 3 lectures. Prerequisite: Ec 201. Ec 202 recommended.

Ec 304 Comparative Economic Systems (3)
Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: Ec 202

* Of the 48 units of electives, 34 will require the approval of the adviser.
Ec 401  International Trade (3)
The United States and the world economy; mechanism of exchange; balance of payments. 3 lectures.

Ec 582  Seminar in Economic Problems (1-3)
Selected problems at an advanced level; distribution of income, private and public finance, economic mobilization, and international trade. 1 to 3 meetings. Prerequisite: 9 units of economics and graduate standing. Maximum of 6 units credit may be earned.

DESCRIPTIONS OF COURSES IN GEOGRAPHY

Geog 221  Elements of Geography (3)
International importance, geographical characteristics, and socio-economic problems of Europe, the Soviet Union, and the Middle East. Primarily for the elementary school teacher. 3 lectures.

Geog 222  Elements of Geography (3)
International importance, geographical characteristics and socio-economic problems of the Orient, Pacific world, Africa, and the Americas. Primarily for the elementary school teacher. 3 lectures.

Geog 308  Global Geography (3)
Survey of man’s utilization and occupation of the earth. Interrelations of human life and elements of natural dependence of nations, and world trade. Supporting power of geographical environment. 3 lectures.

Geog 315  Political and Economic Geography (3)
Survey of world resources, mineral and agricultural, and of the geographical factors affecting their production and distribution. An analysis of economic geographic factors in current international affairs. 3 lectures.

DESCRIPTIONS OF COURSES IN HISTORY

Hist 101, 102, 103  History of Civilization (3) (3) (3)
Development of civilization from earliest times of the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

Hist 112  History of California (3)
Development of California; early explorations, colonization; organization, government, and economy from beginning to the present; development of culture, industry, agriculture, government, and population. 3 lectures.

Hist 117  History and Development of American Labor (3)
Origin and development of trade unionism in the United States; legal status of unionism; role of government; influence of labor leaders; current scene and outlook. 3 lectures.

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. 3 lectures. Prerequisite: Sophomore standing.

Hist 304  Growth of American Democracy (3)
The historic backgrounds of present-day economic, political, and social problems. Development of American institutions and ideals. 3 lectures. Prerequisite: Pol Sc 301

Hist 305  The United States in World Affairs (3)
The origin, forms, and forces of international relations. Current problems of security since World War II. American ideals. Development of United States influence in world affairs. Finding and evaluating authoritative source material on world affairs. 3 lectures. Prerequisite: Pol Sc 301, Hist 304 or equivalent.
Hist 309  History of Latin America  (3)
Significant developments in the history of Latin America since 1492. 3 lectures. Prerequisite: Junior standing.

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: Hist 101, 102, 103 or permission of the instructor.

Hist 411, 412, 413  History of the Far East  (3) (3) (3)
Social, political, economic, and intellectual developments in Japan, China, Korea, and Southeast Asia from earliest times to the present. 3 lectures. Prerequisite: Junior standing.

Hist 583  Contemporary Far East   (1-3)
Study of current developments in the Far East. 1 to 3 meetings. Prerequisite: Graduate standing and major in social sciences. Maximum of six units of credit may be earned.

DESCRIPTIONS OF COURSES IN POLITICAL SCIENCE

Pol Sc 100  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 304, 305, Pol Sc 301 or 401. 3 lectures. Not open to degree students for degree credit.

Pol Sc 201, 202, 203  Principles of Political Science  (2) (2) (2)
The ways in which society organizes and operates governments with particular reference to the United States Constitution and basic American institutions (meets state requirements for American Government). 2 lectures.

Pol Sc 301  American Government  (3)

Pol Sc 306  Modern Political Thought  (3)
Theories of political control and the relationship between man and the state. 3 lectures. Prerequisite: Junior standing.

Pol Sc 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: Pol Sc 301, Hist 304

Pol Sc 312  International Politics  (3)
International political processes and problems; foreign policies and politics in relations between states; conflicts and adjustments. Analyses of selected problems. Prerequisite: History 305

Pol Sc 313  Comparative Government  (3)
Contemporary political situation in Britain, France, Soviet Union, Germany, Italy, and Japan. Policies and problems; forces making for conflict and adjustment. Constitutional, economic, communal, and sovereignty bases. 3 lectures. Prerequisite: Pol Sc 312 or permission of instructor.
Pol Sc 314, 315, 316 Public Administration (3) (3) (3)
Processes and techniques of public policy development and administration. Emphasis on the problems encountered by the career civil servant. Fall: application to national departments and agencies; Winter: application to state agencies and resources; Spring: application to cities, counties, and special districts. 3 lectures. Prerequisite: Pol Sc 203 or 301

Pol Sc 401 State and Local Government (3)
Structure, function and problems of state, county, and city governments. 3 lectures. Prerequisite: Pol Sc 301, Hist 304 or equivalent.

Pol Sc 418 Contemporary Problems and Institutions of the U.S.S.R. (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 the instructor.

Pol Sc 465 Contemporary Problems and Institutions of the Middle East and Africa (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.

Pol Sc 586 Contemporary Problems in International Relations (1-3)
Intensive study of selected current problems in international relations. Geopolitical factors; contributory causes of international conflict, and analyses of proposed solutions. 1 to 3 meetings. Prerequisite: Graduate standing and major in social sciences. Maximum of 6 units may be earned.

DESCRIPTIONS OF INTERDISCIPLINARY COURSES IN THE SOCIAL SCIENCES

Soc Sc 101 Introduction to the Social Sciences (3)
The social sciences in their relationship to modern living; an overview of the contributions of social sciences to cultural, social, and economic development. 3 lectures.

Soc Sc 105 Sources and Methods in the Social Sciences (2)
Location and evaluation of information in the social sciences; introduction to analytical methods in the social sciences. 2 lectures.

Soc Sc 400 Special Problems for Advanced Undergraduates (1-2)
Independent and group study of selected problems in the social sciences. Total credit limited to 4 units. 1 or 2 meetings. Prerequisite: Permission of the department head and junior standing.

Soc Sc 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

Soc Sc 463 Undergraduate Seminar (2)
Intensive study of selected social problems with application of techniques for analysis. 2 meetings. Prerequisite: Completion of Senior Project.

Soc Sc 511 Sources in Social Sciences (3)
Methods of finding and adapting authoritative source materials in the social sciences to the elementary, junior, and senior classroom situation. 3 lectures. Prerequisite: Graduate standing.

Soc Sc 521 Curriculum and Methods in Secondary Social Studies (3)
Content, organization and scope of social studies curriculum in secondary schools, methods of teaching. Evaluation of procedures. 3 meetings. Prerequisite: Major or minor in Social Sciences, admission to teacher education program and graduate standing.
DESCRIPTIONS OF COURSES IN 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 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. Prerequisite: Social Science major or permission 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 251 Laboratory in Group Activities (1)
Skills and techniques of solving problems in large and small groups; conducting and reporting meetings; analyses of leadership dynamics in campus organizations. 1 two-hour laboratory. Total credit limited to 6 units.

Soc 301, 302 Sociology of Social Work (3) (3)
Theory, principles, and methods of social work. Analysis of professional service as offered by organized public and private programs. Stress upon relations of professional social worker to the broader institutional framework of the American society. 3 lectures. Prerequisite: 9 hours of sociology or consent of the instructor.

Soc 303 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.
KELLOGG CAMPUS
POMONA

INTRODUCTION

Instructional work of the southern branch of the College was moved to the Kellogg Campus in the fall of 1956 when the first unit of the new campus building program was completed. Before that, instruction had been at the Voorhis Campus which had been given to Cal Poly in 1938.

Following the educational philosophy and method long established at the San Luis Obispo Campus, the Kellogg Campus offers students the opportunity to obtain occupational instruction in agriculture, engineering, arts and sciences and business in Southern California.

The Agriculture Division offers four-year programs leading to the bachelor of science degree in seven majors. They are Agricultural Business Management, Animal Science, Fruit Industries, Agronomy, Agricultural Services and Inspection, Ornamental Horticulture, and Landscape Architecture. Many courses are also offered in related agriculture.

The Engineering Division offers four-year programs leading to the bachelor of science degree in Aerospace, Civil, Electronic, Industrial, and Mechanical Engineering.

The Arts and Sciences Division offers four-year major programs leading to the bachelor of science degree in Biological Sciences, Language Arts, Mathematics, Physical Education, Physical Sciences, and Social Sciences. Necessary fifth-year courses are offered so that students in the Arts and Sciences Division may complete requirements for the elementary or secondary teaching credentials.

In the field of business, major offerings are provided in Accountancy, Business Management, and Marketing.

GENERAL INFORMATION

FACILITIES

Agriculture Classroom Building

Occupied for the first time at the beginning of the Fall Quarter, 1962, the Agriculture Classroom building has five lecture rooms, 11 laboratories, and staff offices. It provides instructional facilities for majors in Agricultural Business Management, Fruit Industries, Agronomy, Ornamental Horticulture, Animal Science, Agricultural Services and Inspection, and Landscape Architecture.

Administration-Classroom Building

The Administration Building houses the college administrative offices, the Student Personnel Division, the Business Management Division, and other administrative support services. Included also are classroom facilities for instruction in mathematics, English, social sciences, art, advertising, and journalism.

Library

Library and audiovisual services are centered in the Library Building. The library collection includes basic and general books plus specialized documents and periodicals in support of the majors offered.

Educational Computer Center

A computer center is operated on the Kellogg Campus as an all-campus facility. The center utilizes an IBM 1620 digital computer and peripheral data processing equipment. Instruction on the use of the computer is offered by several departments and students are encouraged to use the computer as an integral part of their program.
Science Building

The 75,000 square-foot Science Building, completed in 1956, contains modern classrooms, large lecture rooms, and laboratories. The departments of Biological Science and Physical Science are housed in this building.

Engineering Center

The engineering buildings on the Kellogg Campus include four laboratory and shop buildings, one classroom and laboratory building, and a wind tunnel building. These contain equipment and facilities for instruction in Aerospace, Civil, Electronic, Industrial, and Mechanical Engineering. Included are fully equipped shops for instruction in machine tool practice, drafting rooms, offices, lecture rooms, and specialized laboratories for the major course work.

Business Classroom Building

Completed in 1959, the 28,000 square-foot Business Classroom Building is designed especially for instruction in the business majors. In addition to classrooms and offices, it contains laboratories for the operation of business machines, installation of merchandising displays, and the use of other devices employed in modern business practice.

Agricultural Facilities

In addition to the original farm buildings and shops on the Kellogg and Voorhis properties, completely new units to house livestock, poultry, ornamental plants, and fruits and vegetables were completed in 1958 on the Kellogg Campus. Included are modern sheds and pens for beef cattle, sheep and swine, a meat processing plant and feed mill, facilities for poultry and poultry products, an apiculture unit, a packing and storage house for fruits and vegetables, and substantial greenhouse, headhouse and lath-house units for ornamental horticulture and nursery practice. The new agricultural engineering building houses laboratories for instruction in farm power, farm machinery, agricultural mechanics, carpentry, irrigation, and surveying. Also included are offices for faculty and a lecture facility. The world-famous Arabian horse unit and show arena are important parts of the agricultural establishment.

Physical Education and Athletics

Physical education and athletic facilities, covering 38 acres, are located on the Kellogg Campus. These include a gymnasium with related classrooms and offices. Also fields for football, track, baseball, tennis, and other sports.

Dining Hall

A modern dining hall is in operation on the Kellogg Campus and seats 800 students. It also includes a snack bar, outside patio, and dining rooms for staff, residence students and special groups.

Residence Halls

The Kellogg Campus has residence halls for men and for women. Each hall has accommodations for 212 students. Students live two to each room and are furnished with beds, wardrobe, study desks, bookcases, etc. Each of these air conditioned buildings has a lounge, catering kitchen and recreation room. Coin operated vending machines and laundry facilities are also available. The halls are located within short walking distance of the classroom buildings, cafeteria, library and gymnasium.

Married Student Housing

Housing facilities for married students and their families are on the Voorhis Campus. These consist of one double story and three single story structures equipped with all the necessary facilities for family living. The units house a total of 30 families and all have a living room, kitchenette and bath. Sixteen of these have two bedrooms and 14 are one-bedroom units. The facility is landscaped including a fenced-in play area for children.
Chapel
Occasional nonsectarian services, and college concerts are held in the Voorhis Chapel during the school year. The architectural style of the chapel was patterned after the old Spanish missions.

Health Center
The student Health Center is a new well-equipped medical clinic. It includes X-ray, physiotherapy, laboratory, emergency cast and treatment facilities as well as doctor's offices and examination rooms. Although there are no infirmary facilities, there are day-rest rooms.

STUDENT ORGANIZATIONS AND ACTIVITIES

STUDENT ACTIVITIES

Student Activities are recognized as part of the college educational program. The Student Activities Office, under the direction of the Associate Dean (Activities), is responsible for studying, encouraging and developing student participation in leadership and followership, sound programming and well-balanced living.

STUDENT GOVERNMENT

Student government functions under the jurisdiction of the elected student body officers and the Student Affairs Council, made up of elected representatives of the various campus organizations. All students are members of the Associated Students of the California State Polytechnic College and required to pay a membership fee which entitles the student to full participation in the activities of the association. Membership also includes a subscription to the weekly newspaper, Poly Post, and the privilege of purchasing at a reduced price the college yearbook, Madre Tierra. The self-governing student organization attempts to coordinate all of the student sponsored activities with those of the college in order to make possible the maximum return to the entire educational community.

The government of student affairs and control of property are vested in the Student Affairs Council, the members of which are elected annually. In addition, there are boards and committees to oversee publications, athletics, drama, speech, music, college union and Poly Vue.

Clubs and organizations on the Kellogg Campus cover all departments and activities, and the opportunity exists for every student to take an active part in club life. The college does not recognize either national or local social fraternities or sororities and students are advised against participation in unofficial student organizations that are not in keeping with the college's traditions.

PUBLICATIONS

Poly Post is the official publication of the Associated Students and is published weekly during the school year. Madre Tierra is the yearbook record of student activities carried on during the year at the Kellogg Campus.

POLY VUE AND EDUCATIONAL FIELD DAY

Poly Vue is the name given to the annual open house of the Kellogg Campus that is held in the spring each year. It is designed to show parents and friends the yearly activities and progress of the institution, as well as to provide a time for friendly social activities. The entire affair is organized and carried out by the students.

The Educational Field Day provides an opportunity for high school and junior college youths to compete in agricultural contests.
ATHLETICS

The Kellogg Campus participates regularly in intercollegiate competition in basketball, baseball, football, tennis, and track. Teams in football, basketball, baseball, and track compete in informal league play with other Southern California colleges. Golf, tennis, cross country, swimming, and water polo teams also compete in intercollegiate matches.

An extensive intramural program is an integral part of college life. The program includes such team sports as touch football, basketball, volleyball, and softball. Individual sports such as tennis, badminton, horseshoes, track and field events, swimming, handball, boxing, and wrestling also are a part of intramural competition.

STUDENT PERSONNEL SERVICES

HEALTH AND MEDICAL

Medical services, paid for by the State and the student, are designed to provide on an outpatient basis the services usually rendered by the family physician. Any specialist care or hospitalization is at the student's expense unless student insurance is purchased at the time of enrollment. Full time enrollees may utilize the health services Monday through Friday daily between 8:00 a.m. and 5:00 p.m. with emergencies always taking precedence. Registration in the College is not complete until a student has had his entrance physical examination or received approval for other arrangements from the Medical Director.

COUNSELING

Services of the Counseling Center are available to students with problems in personal, social, vocational, or academic areas. The Test Office is operated within the Center. Reading improvement and study skills problems are handled in group guidance work carried on in the Center. Included, also, is a well-equipped occupational literature library. Each student is assigned a faculty adviser in his major field of study for academic and occupational guidance. The adviser also helps the student in his program planning. Problems in personal and social counseling are identified by the faculty adviser and referred to the professional staff in the Counseling Center.

STUDENT HOUSING

California State Polytechnic College has long been typified by its resident campus. Not only does the College have one of the oldest but also one of the largest housing programs among the state colleges. The College's interest in the resident student, however, goes beyond providing desirable living and dining facilities. It is believed that the on-campus living experience should be an integral part of the "learn by doing" education which directly prepares the graduate to step into industry or the professional fields and to be a positive leader in his community. Through participation in the out-of-class intellectual programs, hall and wing government, social functions and the total living experience, the student's social awareness and competency are greatly strengthened.

Because of the limited amount of residence hall space, it is necessary for some students to live off-campus. The Housing Office maintains a list of private off-campus living facilities available to students.

Unmarried women students may live off-campus only with the permission of their parents or the Associate Dean, Women. Women students who wish to apply to live off-campus must do so by filing the proper forms with the Associate Dean, Women.

PLACEMENT

A centralized placement service is available to students who have completed their college program. The Placement Office and departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience.
Kellogg Campus

No guarantee of placement is made to any student, but a sincere effort is made to find employment for anyone who shows himself worthy of this service.

SUMMER EMPLOYMENT

Students are encouraged to take summer employment in fields related to their major. On-the-job application of course material stimulates an interest in and shows a need for subsequent courses.

The Placement Office receives many summer job listings. Ranchers and businessmen visit the campus in person and large business concerns send recruiters to interview undergraduates for summer employment. A summer job often leads to permanent employment.

PART-TIME EMPLOYMENT

In addition to opportunities for students to earn money through project activities, the college has established a policy of giving a maximum number of students experience by employing them to assist in the operations of the entire campus and farm. The number of campus jobs is greater than in the typical college where regular full-time employees do much more of the work.

SCHOLARSHIPS

Scholarship application blanks are available October 1 of each year. They must be completed and returned before April 15 of the following year for consideration in the next coming college year. Applications received after April 15 are considered only in cases of cancellations. Applications may be obtained by writing the Financial Aids Office.

Sears-Roebuck Foundation Agriculture Scholarship Awards

Annual scholarships of $300 each are awarded to entering men students who enroll as freshmen in one of the agriculture majors offered at the college. The scholarship award to an applicant is determined on the basis of:

1. Financial need for assistance to continue his education.
2. Interest in agriculture and accomplishments as evidenced by his supervised home farm program.
3. Scholarship as shown on the transcript of high school credits which shall include a statement of the number in the graduating class and the applicant’s scholarship ranking in the class.
4. Citizenship and moral integrity, as certified by the high school principal, agricultural teacher, and others qualified to pass judgment on the applicant.

Application may be made through the local high school agricultural teacher who will have all the necessary information. Applications should be in the hands of the scholarship committee by April 1.

Sears-Roebuck Foundation, as a continuation of the freshman scholarship plan already described, awards a $300 sophomore scholarship to the most outstanding student of those receiving Sears-Roebuck awards as first-year students.

Harry E. Rosedale Memorial Scholarship

An award of $100 is made available for a student enrolled in ornamental horticulture at the Kellogg Campus. The student must have completed one year of work in the Ornamental Horticulture Department.

Lemon Men’s Club Annual Award of Merit

A $150 award goes to an outstanding upper classman majoring in fruit industries.

Chet Pencille Memorial Fund

One $200 scholarship and one $100 scholarship may be awarded to entering freshmen and/or students transferring from other colleges who enroll with the Services and Inspection Department and have completed the junior year.
Bandini Fertilizer Company Scholarship
One $100 scholarship is awarded to an outstanding student specializing in ornamental horticulture.

Vitren Corporation Scholarship
One $100 scholarship is made available for an outstanding student in poultry or animal husbandry.

Jim Bastady Memorial Scholarship
An award of $100 is made annually to a deserving freshman specializing in the field of fruit industries.

California Association of Nurserymen Award
An award of $100 is made annually to a student demonstrating a high level of ability and desirable qualities for success in the ornamental horticulture field.

Solar Aircraft Company Scholarships
Two annual $100 scholarships are made available for qualified engineering students who are entering their junior year. One $500 scholarship is made available for an engineering student who will enter the senior year and who has been a recipient of one of the five $100 junior student awards made at the two Cal Poly campuses.

California Fertilizer Association Awards
Two $100 awards are made annually to qualified continuing Cal Poly students in recognition of outstanding achievement in the fields of soil science or agronomy.

Los Angeles County Fire Department Grant
An educational grant of $200 is available to a Cal Poly student who is a dependent of a full-time paid employee of the Los Angeles County Fire Department, a retired employee, a disabled employee, or a widow or orphan of a deceased employee.

Central California and Tulare County Sunkist Managers Club Scholarship
One $150 scholarship is awarded to an entering student in fruit industries.

Foothill Sunkist Managers Club Scholarship
One $150 scholarship is awarded to an entering student in fruit industries.

Sunkist Managers Club Scholarship (San Diego and Orange Counties)
One $150 scholarship is awarded to an entering student in fruit industries.

Tri-County Sunkist Managers Club
One $150 scholarship is awarded to an entering student in fruit industries.

Sunkist Growers, Inc., Scholarship
One $150 scholarship is awarded as a second-year award to the most outstanding recipient of the Sunkist Managers Club Scholarships.

California State Polytechnic College Alumni Association Award
An alumnus of the college provides annually an award of a life membership in the Association to an outstanding senior student who has demonstrated a high quality of leadership in his student life.

Kellogg Supply Co., Inc., Scholarships
One annual scholarship of $125 is available to a qualified and deserving student enrolled in the soil science field and similarly one scholarship of $125 to a student enrolled in ornamental horticulture.

Cal Poly Women's Club Scholarship
A $125 scholarship is made available each year to an outstanding woman student. There is no restriction as to departmental major.
Cal Poly Activity Award
Each year one award (or more) of $100 goes to qualified students who have made, or demonstrate the potential of making, leadership contributions in the area of campus activities and citizenship.

Mattel Toymakers, Inc., Scholarships
A $300 annual scholarship is provided to an industrial engineering upperclassman and a $300 scholarship to a mechanical engineering upperclassman.

Soroptimist Club of Pomona Scholarship
A $150 scholarship is made available to an upperclass woman student with special consideration to applicants living in Pomona, La Verne, Claremont, or San Dimas.

Western Electric Fund
A scholarship covering the cost of required fees, books and other materials in an amount of not less than $400 is provided to an upperclassman majoring in engineering.

STUDENT LOANS
A number of student loan funds on the Kellogg Campus provide temporary assistance to qualified 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 should be made in the Financial Aids Office.

The character and integrity of the student are the primary qualifications for obtaining a loan. Evidence of real need for such temporary assistance must be shown. Students who have spent funds far beyond the necessary school expenses will not be considered for loans, even though need is shown.

Alex M. Wilson Memorial Loan Fund
The family and friends of Alex M. Wilson established a memorial loan fund in his memory with an original grant of $500. The purpose of this fund is to make short- and long-term loans available to students of California State Polytechnic College.

Alumni Association Loan Fund
The Alumni Association of Cal Poly has established a loan fund to provide financial assistance to deserving students. Both long- and short-term loans can be made from this fund.

Associated Students Loan Fund
The Associated Students established a loan fund with an original grant of $500 for the purpose of making short-term loans available to students enrolled at the Kellogg Campus.

Cal Poly Women's Club Student Accommodation Loan Fund
The Cal Poly Women's Club established a student accommodation loan fund for the purpose of making short-term loans to deserving students.

Chet Pencille Memorial Fund
The Pest Control Operators of California established the Chet Pencille Memorial Fund with an original grant of $2,500. The purpose of this fund is to make short- and long-term loans available to deserving young men enrolled in services and inspection.

Karl Hassler Memorial Loan Fund
This fund was established to provide long- and short-term loans to deserving students with preference given to students preparing for work in the pest control industry.
Laura E. Settle Loan Fund
A loan fund has been established by the California Retired Teachers Association. Long- or short-term loans are available from this fund to senior or graduate students preparing for teaching careers.

Lemon Men's Club Loan Fund
The Lemon Men's Club of California established this loan fund with an original grant of $500 to make short-term loans available to deserving young men. Although preference is given fruit production students, other students are not excluded from receiving loans from this fund.

Animal Science Club Loan Fund
The college animal science club established the Animal Science Club Loan Fund with an original grant of $200. Subsequent to the original grant the Arabian Horse Association of Southern California has contributed an additional $200 to the fund. Although preference is given to students majoring in animal husbandry, other students are not excluded from receiving loans from this fund.

Katherine and Edwin Jobe Loan Fund
Mr. and Mrs. Verne Jobe established this loan fund with an original grant of $4,000 for the purpose of making both short- and long-term loans available to deserving students.

Phillip H. Henry Memorial Loan Fund
Friends of Phillip H. Henry established a memorial loan fund in his memory with an original grant of $1,200. The purpose of this fund is to make short- and long-term loans available to students of California State Polytechnic College.

Terminix Educational Foundation Fund
The Terminix Company Inc. of Los Angeles established this fund with an original grant of $500 to make short- and long-term loans available to deserving students. Although preference is given to students enrolled in services and inspection, other students are not excluded from receiving loans from this fund.

Dr. C. D. N. Gilfillan Memorial Loan Fund
A loan fund to perpetuate the memory of Dr. C. D. N. Gilfillan, former medical director of the Student Health Service at this college, has been established to assist students regardless of major.

Pomona Rotary Club
The Pomona Rotary Club has established a $500 short- and long-term loan fund to assist students who experience a temporary financial need.

Bill Hamilton Jr. Memorial Loan Fund
The parents and friends of Bill Hamilton Jr. have established this short- and long-term loan fund to assist deserving students with preference given to those enrolled in Biological Science and other science majors.

Southern California Meter Association
A $750 loan fund has been established by the members of the Southern California Meter Association for the purpose of making short- and long-term loans available to students enrolled in Engineering Division majors.

West End Soil Conservation District
The members of the West End Soil Conservation District have made available a $500 short-term loan fund for students enrolled in Agriculture Division majors.

California Fertilizer Association Loan Fund
A $500 loan fund has been established by the Soil Improvement Committee of the California Fertilizer Association for the purpose of making small, short-term loans available to deserving students, in order that these students may continue their education.
Ornamental Horticulture Alumni Association Loan Fund

The Ornamental Horticulture Alumni Association established this loan fund to make short- and long-term loans available to students majoring in ornamental horticulture.

Jack Woodruff Memorial Loan Fund

The family and friends of Jack Woodruff established a memorial loan fund for the purpose of making short- and long-term loans available to qualified students enrolled at this institution.

Senior Loan Fund

The fund has been established to provide financial assistance to students in their senior year in college. Qualified seniors may apply to repay borrowed funds after graduation.

National Defense Student Loan Program

The College participates with the Federal Government and the State of California in making available loans to students under provisions of the National Defense Education Act.

Entering freshmen as well as students in advanced standing in any field of study are eligible, although the law provides that special consideration shall be given to (a) students with superior academic background who express a desire to teach in elementary or secondary schools, and (b) students whose academic background indicates a superior capacity or preparation in science, mathematics or engineering. Cal Poly has programs in all of these fields of learning.

The maximum loan to one individual is $1,000 in any one year, and no more than $5,000 total. Loans must be repaid with 3 per cent interest over a period of 10 years beginning one year after the individual ceases to be a full-time student in an institution of higher education. However, a borrower may have 10 per cent of the loan, and the interest thereon, cancelled for each full year of full-time public elementary or secondary school teaching, up to a maximum of 5 years and 50 per cent of the loan.

FEES AND EXPENSES

State Fees and Deposits

Materials and service fee (quarter):
Each student enrolled for six units or less $13.00
Each student enrolled for over six units 25.50
Each student enrolled in summer quarter 25.50

Nonresident tuition (U.S.):
Each student enrolled for 15 units or more (per quarter) 167.00
Each student enrolled for less than 15 units (per quarter per unit or fraction of unit) 11.50

Nonresident tuition (Foreign):
Each student enrolled for 15 units or more (per quarter) 86.25
Each student enrolled for less than 15 units (per quarter per unit or fraction of unit) 5.75

Late registration fee 5.00
Transcript of record fee (no charge for first copy) 1.00
Course credit by special examination fee (per unit) 1.00
Extension course fee (per unit) 6.50
Conference, Short Course or Institute, per person Estimated Cost
Application fee 5.00
Change of program fee 1.00
Failure to meet administratively required appointment or time limit 2.00
Library fines See Schedule in Library
Check returned for any cause 2.00

Library fines See Schedule in Library
Parking fee:
Nonreserved spaces (per quarter):
Each student enrolled for more than six units ........................................ 9.00
Each student enrolled for six units or less ............................................... 4.00
Each alternate car in addition to fee for first vehicle .............................. 1.00
Reserved spaces (per quarter) ................................................................... 15.00
Special groups, per week ......................................................................... 1.00

Other Fees *
Associated student card fee (fall quarter) .................................................. $7.50
Associated student card fee (winter and spring quarters, each) ................. 3.75
Post office fee (all students, per quarter) ..................................................... .50
Graduation fee (must be paid at time application for graduation is submitted) 10.00

Note: Fees for summer quarter are the same as for the other quarters. Fees are subject to change upon approval by the Trustees of the California State Colleges.

Living Expenses

Stud ents Living in campus residence halls
Room and board per quarter, including parking fee (subject to change) ...... $249.00
Housing security deposit (payable prior to occupancy) ............................. 20.00

Note 1: Room and board payable in advance. Arrangements to pay in two equal installments may be made upon special application. A service fee of $4 per quarter shall be charged for the right to make installment payments.

Note 2: Students are required to furnish blankets, bed spreads, and study lamps. The college furnishes weekly linen service of bed sheets and pillow cases.

Note 3: The board plan includes breakfast, lunch, and dinner Monday through Friday excluding college holidays. Weekend meals are available at the Kellogg dining hall on a cash basis.

Typical Student Expenses

Following is an estimate of typical expenses per quarter for students living in campus residence halls. Of the total amount, the student should be prepared to pay from $346 to $400, depending upon his major, at the time of fall quarter registration and approximately the same amount at the time of winter and spring quarter registration.

Associated student card (fall quarter, $7.50, winter and spring quarters, $3.75 each) ................................................................. $7.50
Post office fee (per quarter) ...................................................................... .50
Materials and service fee (per quarter) ...................................................... 25.50
Room and board (15 meals per week) ......................................................... 249.00
Books and supplies (estimated) ................................................................. 50.00
Weekend meals (estimated $15 per month) ............................................. 45.00
Laundry (estimated $10 per month) ........................................................... 30.00

Estimated total expenses per quarter ....................................................... $407.50

Family Housing

Rental charge on apartments:
1-bedroom apartments, furnished, including utilities (per month) ........ $35.00
2-bedroom apartments, furnished, including utilities (per month) ........... 40.00

* Not State fees, subject to change.
§ Proportionate fees apply during summer quarter.
† Students enrolling under Public Law 550 should be prepared to pay all costs at the time of registration. Students enrolling under the auspices of other laws or agencies supplying educational assistance should check in advance with the appropriate agency representative regarding payment of fees and/or costs.
‡ Beginning engineering students should be prepared to pay up to $100 in their first quarter.
The summer quarter at the Kellogg Campus is operated as a full academic quarter identical in duration and organization with the other quarters. The summer quarter provides opportunities for acceleration of program and also helps students make program adjustments that meet prerequisite requirements for normal progression and scheduling throughout the year.

The admission requirements, fees, deposits, and academic regulations for the summer quarter do not differ from those of the other quarters.

ELEMENTARY AND SECONDARY TEACHER PREPARATION PROGRAMS

Rodman F. Garrity
Coordinator, Teacher Credential Programs
V. Barney Anooshian, Head, Physical Education Department
Jerome E. Dimitman, Head, Biological Sciences Department
Richard H. Schoning, Acting Head, Business Management Department
Fernando Penalosa, Acting Head, Social Sciences Department
Robert L. Procasal, Head, Agronomy Department
Ben Siegel, Head, Language Arts Department
Wallace A. Raab, Head, Mathematics Department
Elmer H. Rice, Head, Physical Sciences Department
Lowell K. Weeks, Chairman, Music and Art Department

TEACHING CREDENTIALS OFFERED

California State Polytechnic College is accredited by the State Board of Education to recommend qualified students for the following credentials:

- Standard Teaching Credential—Elementary Specialization
- Standard Teaching Credential—Secondary Specialization
- General Elementary Credential
- General Secondary Credential

The Kellogg Campus offers courses which lead to the five-year Standard Teaching Credential with specialization in elementary or secondary teaching. Prospective secondary school teachers are advised to enroll in one of the following: Agriculture, Biological Sciences, Business Management, Language Arts, Mathematics, Physical Education, Physical Sciences, or Social Sciences. Prospective elementary teachers are advised to enroll in one of the following: Biological Sciences, Language Arts, Mathematics, Physical Sciences, or Social Sciences. Early in the program, the prospective elementary or secondary teacher must also choose a single subject teaching minor. General information brochures on admission and course requirements for the Standard Teaching Credentials are available from the Coordinator of Teacher Credential Programs and from major advisers in the several departments.

The Kellogg Campus also offers courses which lead to the General Elementary and the General Secondary Credentials. General credentials are available only to those students who completed 90 or more quarter units prior to September 1, 1963 and who were regularly enrolled in the 1963 fall quarter. The majors for the General Secondary Credential are Agriculture, Biological Sciences, Language Arts, Mathematics, Physical Education, Physical Sciences, and Social Sciences. General information brochures on course requirements for the General Secondary Credential are available from the Coordinator of Teacher Credential Programs.
ADMISSION TO CANDIDACY FOR TEACHING CREDENTIALS

The selection of candidates to prepare for teaching is accomplished through a three-step process involving campus-wide teacher education committees. These committees determine policies for the teacher preparation program, review the qualifications of all candidates, and decide whether or not the candidate should be admitted to the program. The three steps leading to the final completion of credential requirements are:

Step 1. Approval to enter the teacher preparation program;
Step 2. Approval to participate in student teaching;
Step 3. Final approval for an elementary or secondary credential.

A student who enters the college with the intention of earning a teaching credential must be approved as a candidate for the credential which he is seeking. This procedure involves the filing of an application and completing certain steps as explained later in this section.

Admission to the college is not equivalent to being accepted for the teacher education program.

Requirements and procedures for qualifying for acceptance of candidacy may be secured from the Coordinator of Teacher Credential Programs. Prompt attention to the college's procedures is necessary since approval for candidacy is prerequisite to certain professional courses and student teaching.

Evaluation of the student's qualifications is based on the following factors:

1. Achievement. Satisfactory performance in the area of English usage, reading, spelling, arithmetic, science, handwriting, and the social studies as indicated by scores on achievement tests.
2. Personal Adjustment. Evidence of satisfactory personal adjustment, habits, interests and attitudes as shown by evaluation instruments, observation, interview, and faculty ratings.
3. Speech. Demonstration of satisfactory speech quality and habits as indicated by speech test.
4. Physical Fitness. Evidence of good physical health must be shown before the time of student teaching.
5. Scholarship. Satisfactory scholarship on all work accepted by the college toward curriculum requirements must be in evidence before approval of candidacy for the teaching credential.
   a. Elementary and Secondary credentials, grade point average of 2.50 (on five point scale)
   b. Graduate work, grade point average of 2.75
6. General Education Requirements. All applicants must show satisfactory progress toward meeting specific and degree requirements in general education.
7. Professional Attitude. Applicants should show evidence of ability and willingness to work with pupils, parents, and school officials, through experience in working with youth activities.
THE AGRICULTURE DIVISION
Science Plays an Important Role in Agriculture

Meats Processing, a Part of Agriculture's Related Industry

Students Participate in the College's Farming Program
THE AGRICULTURE DIVISION

Instruction in agriculture on the Kellogg Campus of the California State Polytechnic College is offered in seven majors leading to the Bachelor of Science degree. Students interested in agricultural education may choose a program leading to a standard teaching credential with a major in agriculture. Admission to the Agriculture Division is open to any high school graduate or college transfer who meets the requirements listed in the section on admissions.

Each curriculum is uniquely patterned so that the student may select his major occupational field as a freshman. Basic job-getting technical and exploratory courses are stressed during the first two years while increasing proportions of general education and supporting courses are found in the last two years. The beginning student, therefore, is normally highly motivated as a result of the opportunity to begin study directly in his major. In addition, it is possible for him to determine in a short time whether or not he is fitted for work in the field he has selected.

The courses offered in each agricultural curriculum may be conveniently 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 instruction leading to specific preparation for the occupational field of the student's choice.

2. Related agriculture—Supporting courses in agriculture selected from closely allied fields. They supplement the major agricultural block in (1).

3. Science and mathematics—Courses selected from scientific fields which provide basic biological, physical and social science and mathematical background and support to the agricultural block in (1) and (2) above.

4. Humanistic-social—Courses which provide cultural background for intelligent living in a complex world society.

Courses are distributed throughout the four years so as to achieve important emphasis and balance in all areas.

The college has facilities necessary for the best preparation possible in its major fields. The college farm consists of fertile soils typical of the Southern California area with enough variation in soil type and climate to give students a broad background of experience. A new agriculture building houses offices, classrooms, laboratories, and auxiliary rooms for the entire division providing modern scientific equipment and supplies conveniently arranged for student use.

A new agricultural engineering building complete with shops and classrooms is equipped to provide training in mechanics for students throughout the Agriculture Division. Auxiliary buildings house farm machinery and tractors.

The Agricultural Business Management major has laboratory space in the agriculture building equipped with business machines and other equipment suited to the study and project needs of business management students.

Students majoring in Agricultural Services and Inspection use the facilities of the entire farm in their work in specific production courses. This department has at its disposal complete facilities in bee production including a modern apiary and processing plant.

The Agronomy Department manages approximately 400 acres devoted to the production of field, vegetable and forage crops. Fully equipped soils laboratories and experimental plots are available for student use. Modern equipment and facilities serve instruction in cultural operations, processing, and marketing.

The Animal Science Department is equipped with modern facilities for beef cattle, horses, sheep, and swine to accommodate both college herds and student-owned projects. Barns, feed yards, and 500 acres of both irrigated and natural pasture are available for departmental use. Most recent additions to the depart-
ment include a feed mill and a completely equipped meats processing building. A poultry plant emphasizing egg and meat production complete with a modern dressing plant is available for student use. An adjunct of this department is the world-famous Kellogg Arabian Horse program.

The Fruit Industries Department has for instructional use 60 acres of citrus fruit, 15 acres of avocados, and smaller acreages of deciduous fruits and nuts. This department has at its disposal a variety of specialized equipment for all cultural operations. A modern, student-operated packinghouse is used to process fruit from the college orchards.

The Landscape Architecture Department has design laboratories, special service rooms, project court and other auxiliary facilities located in the new agriculture building. In addition the entire campus is used as a laboratory for design problems, many of which have been installed by students to enhance the beauty and utility of the campus.

The Ornamental Horticulture Department has more than 70 acres devoted to ornamental plantings for use in laboratory work, with additional land available for commercial flower growing. In addition, this department offers its students the use of nine glasshouses, two lathhouses, two screenhouses, two propagation houses, and numerous hotbeds and coldframes.

In keeping with the college philosophy of "learning by doing," each student is provided an opportunity to learn the fundamental skills involved in the care, maintenance, and operation of all equipment and facilities to assure him of occupational competence. A supervised work program is an important part of instruction and all departments offer jobs outside of classtime so that students may earn while attending college.
SCIENCE OPTIONS IN AGRICULTURE

Cognizant of the technological advancement in all areas of employment in agriculture, the college offers three interdisciplinary programs for agricultural students who desire preparation in depth in specific scientific areas. These programs, referred to as options, are designed to complement agricultural major curricula and provide an opportunity for the graduate to broaden his field of employment into scientific areas related to agriculture. The student may elect one of the science options appropriate for his chosen major. With the approval of the departmental adviser some courses listed for the options may be substituted for requirements in the major curriculum. The three options are described as follows:

AGROPHYSICS

This option combines studies in soils, geology, chemistry, physics, and radioisotope tracer techniques. Study in these areas will expand the graduate's employment desirability in many employment markets, both agricultural and industrial.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 121-2-3</td>
<td>College Physics.......................... 12</td>
</tr>
<tr>
<td>Math 117</td>
<td>College Algebra and Trigonometry......... 5</td>
</tr>
<tr>
<td>Math 118</td>
<td>Analytic Geometry and Calculus........... 5</td>
</tr>
<tr>
<td>PSc 329</td>
<td>Physical Geology.................................. 4</td>
</tr>
<tr>
<td>Phys 339</td>
<td>Soil Physics.................................. 2</td>
</tr>
<tr>
<td>Chem 334</td>
<td>Radiochemistry or Bio 431 Radiation Biology........... 4 or 3</td>
</tr>
<tr>
<td>Chem 337</td>
<td>Soil Analysis.................................. 2</td>
</tr>
<tr>
<td>Total Units</td>
<td>34 or 33</td>
</tr>
</tbody>
</table>

BIOCHEMISTRY

The biochemistry option prepares the graduate for the dual role of agricultural scientist and scientific analyst. It opens new employment opportunity in industry and government where there is a demand for agriculturists with concentrations of study in biology and chemistry.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 329</td>
<td>Biochemistry II.............................. 4</td>
</tr>
<tr>
<td>Bio 335</td>
<td>Cellular Physiology or VS 205.................... 4</td>
</tr>
<tr>
<td>PSc 102</td>
<td>Physiology of Domestic Animals............... 4 or 3</td>
</tr>
<tr>
<td>Math 117</td>
<td>College Algebra and Geometry................. 5</td>
</tr>
<tr>
<td>Math 118</td>
<td>Analytic Geometry and Calculus............... 5</td>
</tr>
<tr>
<td>Chem 334</td>
<td>Radiochemistry.................................. 4</td>
</tr>
<tr>
<td>Chem 337</td>
<td>Soil Analysis.................................. 2</td>
</tr>
<tr>
<td>Chem 338</td>
<td>Plant Tissue Analysis.......................... 2</td>
</tr>
<tr>
<td>Bio 432</td>
<td>Isotope Tracers.................................. 3</td>
</tr>
<tr>
<td>Total Units</td>
<td>33 or 32</td>
</tr>
</tbody>
</table>
BIOMETRICS

Biometrics is the application of mathematical-statistical theory to agriculture. The graduate will be prepared to design experiments, collate and analyze results of industrial or government research, design and analyze surveys, process data using modern computers, and arrive at management decisions related to agriculture in government and industry.

<table>
<thead>
<tr>
<th>Units</th>
<th>Math 117</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>College Algebra and Trigonometry 5</td>
</tr>
<tr>
<td>Units</td>
<td>Math 118</td>
</tr>
<tr>
<td></td>
<td>Analytic Geometry and Calculus 5</td>
</tr>
<tr>
<td>Units</td>
<td>Math 201-2-3</td>
</tr>
<tr>
<td></td>
<td>Analytic Geometry and Calculus 9</td>
</tr>
<tr>
<td>Units</td>
<td>Math 211</td>
</tr>
<tr>
<td></td>
<td>Descriptive Statistics 3</td>
</tr>
<tr>
<td>Units</td>
<td>Math 221</td>
</tr>
<tr>
<td></td>
<td>Automatic Programming for Digital Computers 1</td>
</tr>
<tr>
<td>Units</td>
<td>Math 311</td>
</tr>
<tr>
<td></td>
<td>Mathematical Statistics I 3</td>
</tr>
<tr>
<td>Units</td>
<td>Math 322</td>
</tr>
<tr>
<td></td>
<td>Mathematical Statistics II 3</td>
</tr>
<tr>
<td>Units</td>
<td>Math 400</td>
</tr>
<tr>
<td></td>
<td>Topics in Applied Mathematics (Design of Experiments) 2</td>
</tr>
</tbody>
</table>

Total Units 31
AGRICULTURAL BUSINESS MANAGEMENT
DEPARTMENT

Department Head, William P. Rowley
David E. Cole Milo G. Lacy

The Agricultural Business Management major is a business program applied to the agricultural industry. It is designed to train students for such positions as agricultural business manager, agricultural credit manager, farm loan officer, produce buyer, purchasing agent, land appraiser, government administrator, and personnel manager. In addition to business management, sales and sales-promotional training, students may elect studies in specified production fields to gain valuable production techniques and experience necessary for job competency.

To satisfy a growing need in the agricultural marketing and distribution fields, students are prepared for careers in produce marketing, advertising, merchandising, manufacturer representation, food brokerage, sales and public relations in agriculture's related fields.

The student will be well prepared for marketing activities, since major courses are complemented with production courses and food processing facilities on the campus. This "learn by doing" technique affords the student a wealth of knowledge and equips him to handle and merchandise commodities through a more comprehensive knowledge of the product.

Much of agriculture's product is merchandised as processed food or fresh produce. The food distribution industry cooperates with this department in training and job experience programs to prepare students for employment in this field. Buying practices, merchandising techniques and marketing functions are studied in detail.

To supplement classroom and laboratory sessions, field trips are taken to distribution centers, warehouses and retail stores, to agricultural industries and production centers. Frequent campus visits by industry representatives further enrich student experiences. Undergraduate students are encouraged to find part-time employment in related agricultural industry and commerce.

Special science options are available to students in the department and are described in the division introductory statement.

CURRICULUM IN AGRICULTURAL BUSINESS MANAGEMENT

<table>
<thead>
<tr>
<th>Freshman</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Agricultural Business (ABM 101)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Administration (Bus 121)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Agricultural Mechanics (AE 121, 122)</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Freshman Composition (Eng 104, 105, 106)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Health Education (PE 107)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Mathematics (Math 101)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Business Mathematics (Math 106)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physical Education (PE 141)</td>
<td>½</td>
<td>½</td>
<td>¾</td>
</tr>
<tr>
<td>Basic Biology (Bio 115)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Physical Science (PSc 101, 102)</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>General Psychology (Psy 202)</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 ½</strong></td>
<td><strong>17 ½</strong></td>
<td><strong>16 ½</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>F</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Instruction Training (ABM 203)</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Salesmanship (Mktg 208)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principles of Economics (Ec 201, 202)</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Public Speaking (Sp 200)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Report Writing (Eng 216)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
† Literature
General Physical Science (PSc 103) ........................................... 3
Physical Education (PE 141) ...................................................... 4
1/2 1/2 1/2
Principles of Accounting (Acc 121, 122, 123) 3 3 3
Business Law (Bus 301, 302) .................................................... 3
† Philosophy, or Literature .......................................................... 3
* Electives ................................................................................. 4 3

Junior
Agricultural Credit (ABM 301) ...................................................... 3
Advertising (ABM 305) .................................................................. 3
Agricultural Sales and Service (ABM 302) ...................................... 3
Agricultural Marketing (FM 304) .................................................. 3
Agricultural Economics (FM 311) ................................................... 3
Descriptive Statistics (Math 211) or Business Forecasting (Bus 311) 3
Economic Problems (Ec 213) .......................................................... 3
Human Relations (Psy 304) ............................................................ 3
American Civilization (Am Civ 301, 302, 303) 3 3 3
Economic Geography (Geog 312) ................................................... 3
* Electives ................................................................................. 4 4 5

Senior
Food Merchandising (ABM 413) ..................................................... 3
Wholesaling (ABM 412) ................................................................. 3
Personnel Management (ABM 402) ............................................... 3
Retailing of Agricultural Products (ABM 414) ............................... 3
Transportation of Agricultural Commodities (ABM 416) ............... 3
Senior Project (ABM 461, 462) ....................................................... 2 2
Undergraduate Seminar (ABM 463) .............................................. 2
Land Appraisal and Sales (ABM 406) ............................................. 3
Agricultural Labor-Management Relations (ABM 418) ................. 3
Insurance Principles (Bus 403) ..................................................... 3
State and Local Government (Pol Sc 401) ..................................... 3
Advanced Public Speaking (Sp 300) .............................................. 3
* Electives ................................................................................. 2 5 5

DESCRIPTS OF COURSES IN AGRICULTURAL
BUSINESS MANAGEMENT

ABM 101 Introduction to Agricultural Business (3)
The field and scope of agricultural business. Fundamental concepts, tools, and practice. 3 lectures.

ABM 203 Job Instruction Training (2)
The principles and techniques of instructing mechanical or technical jobs. 2 lectures.

ABM 301 Agricultural Credit (3)
Use of credit in establishing and operating the agricultural enterprise. Extension of credit and collection of accounts by business dealing in agricultural supplies and products. 3 lectures.

* All students will select twenty-four units from courses in agriculture production majors with the approval of the adviser. Chem 324, 325, 326 may be substituted for PSc 101, 102, 103.
† To be selected from the General Education list.
Agriculture Division

ABM 302 Agricultural Sales and Service Management (3)
Supervision of people who sell to and serve farmers. Selecting, training, directing, and evaluating personnel. Methods of payment, use of advertising, promotion, incentives and service. 3 lectures. Prerequisite: Marketing 208

ABM 305 Advertising and Promotion of Agricultural Products (3)
Principles of demand creation. Relationship of market research, production, packaging, advertising, and sales promotion. Emphasis is on marketing orders and promotion. Practical application of advertising principles to agricultural business. 2 lectures, 1 laboratory.

ABM 402 Personnel Management (3)
Employer-employee relationships. Manpower utilization and management of related industry and commerce. 3 lectures.

ABM 406 Land Appraisal and Sales (3)
Principles of California real estate code governing real estate transactions and appraisal of rural and suburban property. 3 lectures.

ABM 412 Wholesaling of Agricultural Products (3)
Principles, methods, and techniques of buying, receiving, storing and handling agricultural products between the producer and the retail outlets. Functions of brokers, wholesaler—voluntary and cooperative types. 3 lectures.

ABM 413 Food Merchandising (3)
Agricultural marketing practices, emphasizing the selling function. A study of related displays, sales and promotions, customer motivation, and trends in the field of supermarket operation. Guest speakers, and field trips. 3 lectures.

ABM 414 Retailing of Agricultural Products (3)
Principles of buying, receiving, storing, and handling agricultural products for profitable retail store operations. Costs, facilities, techniques, and methods. Store operations—supermarket, shopping centers, etc. 2 lectures, 1 laboratory.

ABM 416 Transportation of Agricultural Commodities (3)
Principles of transportation of perishable agricultural commodities. Trends—rail, truck and air as carriers of agricultural products. Detailed examination of various regulations, documents and rate structures of the different means of transport. 3 lectures.

ABM 418 Agricultural Labor-Management Relations (3)
Study of existing union contracts pertinent to the agricultural industry. Responsibilities of management and labor. Trends and practices. 3 lectures.

ABM 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

ABM 463 Undergraduate Seminar (2)
New methods and developments, practices, and procedures in the field. 2 meetings. Prerequisite: Senior standing.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.

DESCRIPTIONS OF COURSES IN FARM MANAGEMENT

FM 304 Agricultural Marketing (3)
Problems in marketing agricultural products both co-operatively and otherwise. Structure and functions of the market. Emphasis on distribution of California farm products. 3 lectures. Prerequisite: Ec 201
FM 311  Agricultural Economics  (3)
Consideration of economic principles as they apply to agriculture. Agriculture's role in the economy and policies affecting agricultural resources. 3 lectures. Prerequisite: Ec 201, 202

FM 324  Management Accounting  (4)
Fundamental processes of double-entry accounting considered as a tool of agricultural management with emphasis on practical application. 3 lectures, 1 laboratory.

FM 326  Enterprise Accounting  (3)
Methods of accounting for income, costs, and profit for separate enterprises in diversified agricultural business to achieve most profitable enterprise combinations. 3 lectures. Prerequisite: FM 324

FM 328  Agricultural Enterprise Management  (4)
Methods of measuring profits in agricultural production and business, sources of economic information, land appraisal and description, sources of farm credit and capital, land leases and rental budgeting techniques. 3 lectures, 1 laboratory.

FM 403  Agricultural Prices and Government Control  (3)
General price level, price-making process, price variations and trends, price reports and forecasting, governmental agricultural price control programs, price characteristics of specific agricultural commodities. 3 lectures. Prerequisite: Ec 202
Agricultural Services and Inspection Program offers a broad background in the sciences that serve agriculture. Graduates are prepared for a variety of professional careers and for further studies leading to teaching credentials or advanced degrees.

1. Careers are available in civil service and other positions with county, state, and federal agencies which promote and protect the general public and the various agricultural enterprises. Governmental officials are cooperative agents whose duties are to assist producers and processors and enforce laws and regulations. They advise and supervise in the science of protecting agricultural crops from the numerous insects, mites, nematodes, plant diseases, weeds, rodents, birds and other vertebrate pests; they assure buyers and consumers of fruit and vegetables, seeds, and agricultural chemicals of good quality; and they act as plant quarantine officers. These functions require the services of many new agricultural scientists each year.

2. The marketing of agricultural products presents many possibilities for individuals with a knowledge of pest conditions and quality standards for fruit and vegetables. This knowledge is a requirement in such fields as produce buying, selling, shipping, packing and inspection.

3. Positions in sales, service, and as consulting representatives of the agricultural chemical companies are challenging. These organizations offer employment to graduates with scientific pest control knowledge and a sound understanding of agricultural production practices.

4. Structural and agricultural pest control specialists are needed as owners, supervisors, and field representatives. Many inspection services are required because of the increase in housing and industrial development and intensification and expansion to new crop lands.

Summer appointments with county, state, and federal agencies or private companies after a year of training in this major provide valuable experience and an income.

Special science options are available to students in this department and are described in the division introductory statement.

Curriculum in Agricultural Services and Inspection

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<th>Course</th>
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<tr>
<td>Agricultural Law (SI 101)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<td>Agricultural Engineering (AE 121 or 122)</td>
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<td>Health Education (PE 107)</td>
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<td>Plant Identification (SI 224)</td>
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<td>Pest Control Materials (SI 231)</td>
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<td>Vertebrate Pest Control (SI 223)</td>
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<td>Weeds and Weed Control (Agr 233)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Pest Control Equipment (AE 233)</td>
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<td>Principles of Accounting (Acc 121, 122)</td>
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### Junior

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<tr>
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<td>Plant Quarantine (SI 322)</td>
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<td>Fruit and Vegetable Standards (SI 321)</td>
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<td>Services and Inspection Careers (SI 372)</td>
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<td>General Psychology (Psy 202)</td>
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### Senior

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<td>Senior Project (SI 461, 462)</td>
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<td>Fertilizers (SS 221)</td>
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<td>Biochemistry I (Chem 328)</td>
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### Descriptions of Courses in Agricultural Services and Inspection

**SI 101 Agricultural Law (3)**

Agricultural Code and other laws affecting those agencies and individuals who promote and protect the agricultural industry of California; functions of state and county departments of agriculture and allied organizations. Sources of information. 3 lectures.

**SI 223 Vertebrate Pest Control (4)**

Small animals and birds injurious to agricultural crops and structures; emphasizing introduced and native rats and mice, ground squirrels, pocket gophers, rabbits, and moles. Identification, seasonal history, and economic importance. Control methods and materials, their uses and precautions. Related laws and regulations. 3 lectures, 1 laboratory.

* To be selected from the General Education list with not more than 2 units from arts and music.
** To be selected from the General Education list with approval of major adviser.
† To be selected from the General Education list.
SI 224 Plant Identification (4)
Identification of ornamental, orchard, and crop plants by contrast of odors, leaf shapes, and arrangements; fruit and flower types, growth habits; coloration of plant parts; and environmental variations. Consideration of scientific, common, and family name; general propagation and most serious pests. 3 lectures, 1 laboratory. Prerequisite: Bot 120

SI 228 Economic Insect Pests (3)
Recognition and distribution of the important mites and insects attacking the major field, cereal, and truck crops. Hosts and identification of damage to various plant parts. Seasonal history, habits, and problems relating to recommended control measures. 2 lectures, 1 laboratory. Prerequisite: Ent 126

SI 229 Economic Insect Pests (3)
Recognition and distribution of the important mites and insects attacking citrus, deciduous fruit, small fruit, berries, and nut trees. Hosts and identification of damage to various plant parts. Seasonal history, habits, and problems relating to recommended control measures. 2 lectures, 1 laboratory. Prerequisite: SI 228

SI 231 Pest Control Materials (4)
Economic entomology as it pertains to the development of pest control materials; properties and formulations of pesticides; insect, plant, and animal tolerances; application of and precautions for modern insecticides, including the most recent developments; related laws and regulations. 3 lectures, 1 laboratory. Prerequisite: Ent 126, PSc 103 or the passing of a placement test.

SI 303 Horticultural Products (3)
Market quality factors as they affect selection and use of important fruits, vegetables, eggs, and honey. Includes parasitic and non-parasitic defects, maturity, ripening and handling considerations. Governmental agencies concerned with quality and wholesomeness of foods. For non-majors. 3 lectures.

SI 321 Fruit and Vegetable Standards (4)
Standardization provisions of the Agricultural Code relating to fruits, nuts, vegetables, eggs, and honey. Minimum standards for marketing, including maturity, container, marking, and size requirements. Parasitic and physiological market defects, their identification, cause, and legal tolerances. 3 lectures, 1 laboratory. Prerequisite: SI 325

SI 322 Plant Quarantine (4)
Purpose and application of United States and California plant quarantine laws and regulations; identification, habits and seasonal history of pest and diseases concerned; areas under quarantine, commodities covered, restrictions, and established treatments. 3 lectures, 1 laboratory. Prerequisite: Ent 126, Path 223

SI 325 Produce Market Quality (3)
Identification, cause, and detection methods of quality and condition entities resulting from insects, mites, nematodes, birds, mammals, plant diseases, and non-parasitic factors important when marketing major fruits and vegetables. Maturity indexes, size designations, and methods of packing produce. 2 lectures, 1 laboratory. Prerequisite: Path 223

SI 332 Household Pests (3)
Pests attacking plant and animal products in dwellings, food serving, and processing establishments, warehouses, and other enclosures; recognition of pests, damage, habitats; means of control and exclusion; pesticides registered for use in controlling these pests; related laws and regulations. 2 lectures, 1 laboratory. Prerequisite: Ent 126. Offered odd-numbered years.
SI 333 Household Pests (3)
A continuation of SI 332 to include pests existing as nuisances in homes or other enclosures of occupancy, dooryard pests, and pests attacking man and domestic animals, including pets, poultry, and wild animals whose ectoparasites also attack man. 2 lectures, 1 laboratory. Prerequisite: Ent 126. Offered odd-numbered years.

SI 334 Insects Affecting Timber Products (3)
The major and minor insect pests and other arthropods of economic significance in the destruction of wood products, recognition of stages and damage, habits, seasonal history, and control of such pests. Laws and regulations affecting the structural pest control operator. 2 lectures, 1 laboratory. Prerequisite: Ent 126. Offered even-numbered years.

SI 336 Beekeeping (3)
Care, management, and manipulation of bees by beginners. Practical application of principles for effective establishment and maintenance of home and commercial apiaries. Recognition and control of bee diseases. Laws and regulations pertaining to beekeeping. 2 lectures, 1 laboratory. Prerequisite: Ent 126.

SI 372 Services and Inspection Careers (1)
Career opportunities and employment techniques. Application forms, letters of application, data sheet, portfolio, the interview, and application follow-up. 1 lecture. Prerequisite: Junior standing.

SI 419 Seed Technology (2)
Identification of agricultural, vegetable, and weed seeds; inspection methods and procedures. Technique of purity and germination tests in accordance with official procedures. California seed law and other pertinent laws and regulations. 2 lectures. Offered even-numbered years.

SI 424 Pest Control Practices (3)
Inspection methods and procedures for important pests of major agricultural crops. How to determine when control measures are necessary and evaluation of control programs. Detection surveys. Related laws and regulations. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

SI 437 Nursery Procedures and Pests (2)
Inspection techniques and procedures for nursery plants prepared and offered for sale. Identification and relative importance of pests. Control recommendations, plant tolerances to pesticides. Quarantine and shipping requirements. Related laws and regulations. 1 lecture, 1 laboratory. Offered odd-numbered years.

SI 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

SI 463 Undergraduate Seminar (2)
New methods and developments, practices, and procedures in the field. 2 meetings.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.
AGRONOMY DEPARTMENT

Department Head, Robert L. Procsal

George W. Schmitz   Dwight C. Thompson
Harry V. Welch, Jr.

The Agronomy Department offers instruction in the science and related studies concerned with crops and soils. The technical knowledge and operational skills acquired qualify the graduate to pursue careers in farm management; with seed, fertilizer and pest-control industries; in the processing and marketing of agricultural products; with agencies of the federal and state governments, and in education. Placement opportunities for graduates are both excellent and rewarding.

Four hundred acres are operated by the Agronomy Department in the production of cereals, field crops, truck crops and pastures. Students participate in the operational phases of this program through class laboratories and many of them through employment in the farming operations of the department. Actual experience is related to classroom instruction through the physical facilities of the college. Students also gain production skills through participation in Foundation crops projects wherein they grow crops for experience and profit. The new Agriculture Building provides modern instructional equipment and laboratories. A processing building, greenhouse and experimental plant growing area are integral working facilities of the department.

Since courses in agronomy deal with agriculture, biology, chemistry and mathematics, it is recommended that high school students interested in this major field seek to enroll in these subjects before entering college.

Special science options are available to students in this department and are described in the division introductory statement.

CURRICULAR OPTIONS

Crops
The Agronomy Crops Option emphasizes preparation for the plant science field including culture, management, marketing and related services.

Soils
The Agronomy Soils Option is concerned with studies in scientific soils, soils management and plant and soil analysis.

CURRICULUM IN AGRONOMY

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<td>Introduction to Plant Science (Agr 111)</td>
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<td>Cereal Crops (Agr 122)</td>
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<td>Vegetable Crops (Agr 226)</td>
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Sophomore

Field Crops (Agr 121) 4
Weeds and Weed Control (Agr 233) 4
Soils (SS 121) 4
Soil Management (SS 122) 4
Fertilizers (SS 221) 4
Farm Surveying (AE 131) 2
General Plant Pathology (Path 223) 4
Principles of Economics (Ec 201, 202) 3
Public Speaking (Sp 200) 3
General Psychology (Psy 202) 3
Health Education (PE 107) 2
Physical Education (PE 141) ½ ½ ½
Courses to complete major and electives 15½ 17½ 16½

Junior

Irrigated Pastures (Agr 333) 4
Irrigation (AE 240) 4
Genetics (Bio 303) 3
Management Accounting (FM 324) 4
General Inorganic Chemistry (Chem 324, 325) 4 4
Organic Chemistry (Chem 326) 4
†Literature 3
Courses to complete major and electives 2 13 6
17 17 17

Senior

Crop Farm Operation (Agr 437) 3
Senior Project (Agr 461, 462) 2 2
Undergraduate Seminar (Agr 463) 2
American Civilization (Am Civ 301, 302, 303) 3 3 3
Biochemistry I (Chem 328) 4
†Literature or Philosophy 3
Courses to complete major and electives 12 4 8
17 16 16

CROPS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Freshman
AE 123 Welding (2)

Sophomore
Agr 226 Harvesting and Marketing (4)
AE 227 Farm Power (2)
AE 221 Farm Machinery (2)

Junior
Agr 322 Crop Technology (4)
SI 231 Pest Control Materials (4)
SI 228 Economic Insect Pests (3)

Senior
Agr 331 Seed Production (4)
Agr 421 Crop Diseases (4)
Agr 404 Plant Breeding (3)

SOILS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Sophomore
Math 211 Descriptive Statistics (3)
AE 132 Surveying (2)

Junior
SS 222 Soil Conservation (3)
SS 223 Range Management (4)
SS 333 California Soils (3)
PSc 329 Physical Geology (4)

Senior
SS 431 Advanced Soil Management (3)
Bot 322 Plant Physiology (4)
Chem 337 Soil Analysis (2)
Chem 338 Plant Tissue Analysis (2)

† To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN AGRONOMY

Agr 111 Introduction to Plant Science (3)
Diversification and importance of economic crop plants. Environmental factors as they affect plant growth. Physical characteristics of soil, soil-water relationships, terminology. 3 lectures.

Agr 121 Field Crops (4)
Growing of California field crops other than cereals, such as row-planted cotton, flax, field beans, sugar beets, and miscellaneous fiber and oil crops. Characteristics of the major varieties in relation to the best cultural, harvesting, marketing, disease and pest control practices. 3 lectures, 1 laboratory.

Agr 122 Cereal Crops (4)
Production and management of the major California cereal crop varieties. Characteristics of these varieties in relation to applicable cultural practices, harvesting, cost of production, grain grading and processing, marketing, disease and pest control. 3 lectures, 1 laboratory.

Agr 123 Forage Crops (4)
Production, harvesting, and utilization of principal California forage crops. Identification and utilization of range plants studied in the field. 3 lectures, 1 laboratory.

Agr 130 General Field Crops (4)
Production, harvesting, and use of important California cereal and field crops. Production areas, varieties, disease, and pest control. 3 lectures, 1 laboratory.

Agr 224 Harvesting and Marketing (4)
Harvesting methods and procedures; current handling and packaging techniques; grades and grading, minimum standards, containers, storage; requirements of crops for processing. 3 lectures, 1 laboratory.

Agr 226 Vegetable Crop Production (4)
Cultural practices, varieties, economics of production of major warm and cool season vegetables. Application of production techniques on college operated acreage. 3 lectures, 1 laboratory.

Agr 230 General Truck Crops (4)
Principles of production, harvesting, and marketing of major truck crops grown in California. Specific production problems relating to areas. 3 lectures, 1 laboratory.

Agr 233 Weeds and Weed Control (4)
Recognition and control of weeds injurious to California crop and range lands. Classification of weeds and their seed. Dissemination; cultural, chemical, and biological control practices; laws regarding weeds. 3 lectures, 1 laboratory.

Agr 322 Crop Technology (4)
Grades and qualities of California crops as they affect market values. Determination of factors affecting optimum harvesting and storage. Technological processes as they affect processing. 3 lectures, 1 laboratory. Prerequisite: Agr 121, 122, 224

Agr 331 Seed Production (4)
California field, vegetable and flower seed production. Location, methods of growing, harvesting, storing. Economic outlook for principal kinds. Certified seed production. Seed laws. 3 lectures, 1 laboratory. Prerequisite: Agr 121, 122, 133, 226

Agr 333 Irrigated Pastures (4)
Culture, management, fertilization, composition, and costs of California irrigated pastures. Identification, adaptation, and utilization of major irrigated pasture varieties. 3 lectures, 1 laboratory.
Agr 404 Plant Breeding (3)
Principles and techniques of improving ornamental and agronomic plants. 2 lectures, 1 laboratory. Prerequisite: Bio 303

Agr 421 Crop Diseases (4)
Methods of recognizing and controlling diseases of commercial vegetable and field crops. Chemical and cultural control methods that are presently being utilized in California. Prerequisite: Bot 120, Path 223

Agr 437 Crop Farm Operation (3)
Operation of commercial vegetable and field crop acreages. Land preparation, cultivation, planting, fertilization, and pest control. Familiarity with more specialized farm equipment. 2 lectures, 1 laboratory. Prerequisite: Agr 121, 122, 224 or 226

Agr 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

Agr 463 Undergraduate Seminar (2)
New methods and developments. Practices and procedures in the field. 2 lectures.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.

DESCRIPTIONS OF COURSES IN SOIL SCIENCE

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, drainage, and irrigation practices on soil productivity. 3 lectures, 1 laboratory. Prerequisite: SS 121

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 or SS 230

SS 222 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. 2 lectures, 1 laboratory. Prerequisite: SS 121 or SS 230

SS 223 Range Management (4)
Soil and plant characteristics of rangelands. Management practices used to maintain range resources and increase production of forage and livestock. Identification of important range plants. 3 lectures, 1 laboratory. Prerequisite: SS 121 or SS 230

SS 230 General Soils (4)
General properties of soils including common soil management, fertility, and conservation practices. 3 lectures, 1 laboratory.

SS 333 California Soils (3)
Origin, formation, and classification of California soils. Interpretation and utilization of soil survey and other data in crop production. 2 lectures, 1 laboratory. Prerequisite: SS 121

SS 431 Advanced Soil Management (3)
Soil and water problems affecting the production of crops. Methods of studying these problems and recent advances in soil and water management. 2 lectures, 1 laboratory. Prerequisite: SS 122, 221
ANIMAL SCIENCE DEPARTMENT

Department Head, Harry B. McLachlin

Norman K. Dunn    Jack T. Gesler
Homer D. Fausch    Mack H. Kennington    Edward A. Nelson

The location of the Kellogg Campus near the center of California's expansive commercial livestock feeding, and Los Angeles, the largest slaughter and meats processing center of the west, combines naturally with college facilities to provide opportunities for students to obtain specialized and practical training in the animal industry in production, management, feeding, marketing and processing.

The courses in animal science are designed to prepare men and women for careers in education and in commercial and scientific phases of the related agricultural industry as well as ranching.

Equipment for instruction consists of a well-equipped laboratory facility, 330 acres of range land and over 100 acres of irrigated pasture with well-equipped barns, a meat and poultry processing laboratory, a feed mill, and well-bred herds and flocks representative of various classes of livestock.

The livestock includes a purebred herd of Aberdeen-Angus, and Hereford, Aberdeen-Angus and Shorthorn commercial feeder cattle; the Kellogg herd of registered Arabian horses; purebred Shetland ponies; flocks of purebred Rambouillet, Southdown and Suffolk sheep, a herd of Minnesota No. 1, 2, 3 and cross-bred swine and fryer projects and a poultry laying flock. Through the courtesy of prominent local breeders, commercial feeders, and livestock auctions and commission firms, excellent opportunities are offered for additional field study of methods of management and breeding.

Facilities for student owned and operated livestock projects are made available by the College Foundation.

Special science options are available to students in this department and are described in the division introductory statement.

CURRICULUM IN ANIMAL SCIENCE

**Freshman**

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<td>Elements of Market Beef Production (AS 131)</td>
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<td>Elements of Swine Production (AS 122)</td>
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<td>Elements of Sheep Production (AS 123)</td>
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<tr>
<td>Feeds and Feeding (AS 101, 102)</td>
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<td><em>Agricultural Engineering</em></td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<td>Physical Education (PE 141)</td>
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**Sophomore**

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<td>Meat Animal Slaughter and Cutting (AS 227)</td>
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<tr>
<td>Approved Animal Science Courses</td>
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<tr>
<td>Plant Science (Select one) (Agr 122, 123, 333)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Genetics (Bio 303)</td>
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<td>General Zoology (Zoo 134, 135)</td>
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<td>General Inorganic Chemistry (Chem 324)</td>
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<td>General Bacteriology (Bact 221)</td>
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*Agricultural Engineering—Select four units from AE 121, 122, 131, two units from AE 123, 221, 227, 240.*

†Women Animal Science majors would substitute Meats Utilization (AS 325).
### California State Polytechnic College

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<td>Animal Breeding (AS 304)</td>
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<tr>
<td>Animal Parasitology and Control (VS 302)</td>
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<td>General Inorganic Chemistry (Chem 325, 326)</td>
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<td>Public Speaking (Sp 200)</td>
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<td>Management Accounting (FM 324)</td>
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Senior

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<tr>
<td>Animal Nutrition (AS 402)</td>
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<td>Agricultural Enterprise Management (FM 328)</td>
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<td>Economics (Select One) (FM 311, 313, ABM 301)</td>
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<td>† Literature or Philosophy</td>
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<td>Electives</td>
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**DESCRIPTIONS OF COURSES IN ANIMAL SCIENCE**

**AS 101 Feeds and Feeding (2)**
Identifications 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; the use of by-product feeds. 2 lectures.

**AS 102 Feeds and Feeding (3)**
Digestion and utilization of feeds; feeding standards and computation of standard rations for livestock; economy in feeding, and purchasing feeds by nutritive values; important vitamins and minerals and feed sources thereof. 2 lectures, 1 laboratory. Prerequisite: AS 101

**AS 111 Animal Agricultural Science (3)**
Designed for non-agricultural majors as an orientation course pertaining to breed identification, production, marketing and economics of agricultural animals. 3 lectures.

**AS 122 Elements of Swine Production (4)**
History and development of swine industry. Types and breeds of swine. Hog production under California and Midwestern conditions. Common feeds used to supply nutrition requirements. Practice in handling, feeding, and selection. 3 lectures, 1 laboratory.

* Agricultural Engineering—Select four units from AE 121, 122, 131, two units from AE 123, 221, 227, 240.
† To be selected from the General Education list.
AS 123  Elements of Sheep Production  (4)
Sheep operations in the United States. Emphasis on breeds and adaptation to California conditions. Principles of selecting, culling, and judging sheep, market classes and marketing of sheep. Home slaughter and carcass cuts. Factors affecting wool value. 3 lectures, 1 laboratory. Prerequisite: AS 101

AS 124  Basic Equitation  (2)
Designed for those interested in training to ride and handle horses. Includes grooming, saddling, bridling, parts of and care of the equipment of horses, riding techniques. 2 laboratories.

AS 131  Elements of Market Beef Production  (4)
Survey of market beef production in the United States with emphasis on Southern California. Beef cattle terms. Study of central market and functions. Grades and classes of market cattle and carcasses. Importance of by-products. Breed characteristics. 3 lectures, 1 laboratory.

AS 223  Market Swine Production  (4)
Management of the swine herd and care of pigs until weaning. Selection of feeder pigs. Feeding and managerial practices involved in developing the finished product. Market channels, cycles, production cost analysis, hog slaughter, carcass grading, and pork processing. 3 lectures, 1 laboratory. Prerequisite: AS 102, 122

AS 225  Elements of Horse Production  (3)
An introductory course to acquaint the student with the field of horse production, breeds and types of horses, feeding, judging, unsoundnesses, diseases. 2 lectures, 1 laboratory.

AS 226  Livestock Judging  (2)
Training in selection of beef cattle, sheep, swine, and horses according to breed, type, and use. 2 laboratories. Prerequisite: Sophomore standing.

AS 227  Meat Animal Slaughter and Cutting  (3)
The practice of slaughtering and cutting of cattle, sheep and swine. Emphasis on chemical composition, yields, grades, federal and state inspection and the fundamentals of curing and smoking meats. 2 lectures, 1 laboratory.

AS 232  Sheep and Wool Production  (4)
Management of commercial sheep operations. Breeding, lambing, selection, culling, marketing, shearing, grading, packing, and judging wool. Disease and parasite control. Range management. 3 lectures, 1 laboratory. Prerequisite: AS 102, 123

AS 233  Commercial Beef Production  (4)
Grading and selection of stocker and feeder cattle; necessary margin. Factors affecting economy and efficiency of gain. Disease problems and control. Feeder production on winter range, silage, irrigated pasture, spoilage, hay, by-products. Supplemental feeding. 3 lectures, 1 laboratory. Prerequisite: AS 102, 131

AS 234  Horseshoeing  (3)
Fundamentals of horseshoeing, anatomy and physiology of the horse's foot, pastern and legs. Trimming feet, fitting, nailing shoes. Normal shoeing, corrective shoeing. 1 lecture, 2 laboratories.

AS 303  Advanced Livestock Feeding  (2)
Nutritional requirements for maintenance, growth, fattening, reproduction and lactation. Calculation of efficient and economical rations. Sources and composition of nutrients. Biological and replacement value of feeds. Recent developments in feeding. 2 lectures. Prerequisite: AS 102

AS 304  Animal Breeding  (3)
Physiology of reproduction, application of genetics to animal breeding. Systems of mating animals, use of inbreeding, crossbreeding, and selection as applied to farm animals. 3 lectures. Prerequisite: Bio 303
AS 305 Artificial Insemination of Domestic Animals (3)
Fundamentals and techniques used in the artificial breeding of cattle, sheep, swine and horses, physiological aspects of reproduction, evaluation of artificial insemination to the livestock industry. 2 lectures, 1 laboratory. Prerequisite: VS 206

AS 325 Meats Utilization (3)
Introduction to technology of meat, including cutting, wrapping, curing, smoking, freezing, and storage problems. Economic aspects of procurement, portion control and preparation, inspection and grading. For women Animal Science majors and interested non-majors. 2 lectures, 1 laboratory.

AS 328 Textile Fibers and Products (3)
Study of textile fibers of animal origin, their properties, capabilities, and means of identification as well as by-products of the animal industry, their importance and methods of merchandising and marketing. 2 lectures, 1 laboratory

AS 329 Advanced Horse Production (3)
An advanced and detailed course in breeding, mare and stallion selection, conformation and bloodlines, fertility and sterility diagnosis, pregnancy, gestation and foaling management, feeding techniques for stallions and mares, breeding problems, records and office procedures. 2 lectures, 1 laboratory. Prerequisite: AS 225

AS 332 Beef Cattle Husbandry and Improvement (3)
Feeding and managing the breeding herd. Investment requirements and cost of production. Equipment, disease problems, and selection. Record keeping and performance testing. Fitting and marketing sale cattle. Breeding systems and bloodlines. 2 lectures, 1 laboratory. Prerequisite: AS 233

AS 335 Meat Processing (3)
Manufacturing of processed meats, with emphasis on sanitation, sausage formulation, quality control, and smokehouse operations. 1 lecture, 2 laboratories. Prerequisite: AS 227

AS 336 Meat Classification and Grading (2)
Factors related to carcass quality, conformation, and finish, including meat classification, grading, and judging of carcass and wholesale cuts of beef, pork, and lamb. Field trips to nearby packing plants required. 1 lecture, 1 laboratory. Prerequisite: AS 227

AS 337 Wool Technology and Marketing (3)
Factors which determine commercial value of fleeces. Clean fleece weight for grade and relative importance of quality, length, soundness, purity, crimp, color, and condition. Markets and wool marketing. Management practices affecting wool value. 2 lectures, 1 laboratory. Prerequisite: AS 232. Offered odd-numbered years.

AS 339 Basic Horse Training Techniques (2)
For students interested in training, principles, and procedures. Includes descriptions and practical experience in basic training procedures, driving on long lines, breaking foals to lead, working on long line, grooming, fitting and teaching horses to show in breeding classes. 2 laboratories. Prerequisite: AS 329

AS 402 Animal Nutrition (3)
Metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures. Prerequisite: AS 102, Chem 328
AS 421 Meat Technology (3)
Characteristics of meat and meat products as related to processing operation, manufacture, and marketing. 2 lectures, 1 laboratory. Prerequisite: AS 227, Chem 326. Offered even-numbered years.

AS 422 Commercial Feedlot Operations (3)
Management of the commercial feedlot. Selection of feeder cattle; procurement of feedstuffs; economical rations; disease control; livestock and equipment financing; recordkeeping and feeder-owner agreements; and cattle marketing. 2 lectures, 1 laboratory.

AS 423 Livestock Marketing (3)
Livestock marketing practices and procedures. Observations of the public market. Study of factors affecting livestock and meat prices. Functions of livestock marketing agencies. 2 lectures, 1 laboratory. Prerequisite: AS 131, 122, 123. Offered even-numbered years.

AS 441 Advanced Livestock Judging (2)
Intensive practice in livestock judging in preparation for livestock judging team to compete in intercollegiate contests. 2 laboratories. Prerequisite: AS 326

AS 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

AS 463 Undergraduate Seminar (2)
New methods and developments, practices, and procedures in the field. 2 lectures. Prerequisite: Senior standing.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.

DESCRIPTION OF COURSE IN DAIRY HUSBANDRY

DH 230 General Dairy Husbandry (4)
Selection, breeding, feeding, and management of dairy cattle, composition and food value of dairy products. Dairy industry statistics and opportunities. 3 lectures, 1 laboratory.

DESCRIPTIONS OF COURSES IN POULTRY INDUSTRIES

PI 131 Poultry Principles (4)
Fundamentals of poultry production. Natural history, anatomy, physiology and life cycles of birds. Kinds, varieties, and breeds of poultry and their commercial uses. 3 lectures, 1 laboratory.

PI 132 Brooding and Rearing (4)
Principles and practices of purchasing, brooding, rearing, and selling chickens for various market demands. 3 lectures, 1 laboratory. Prerequisite: PI 131

PI 133 Egg Production (4)
Principles and practices of the management of chickens in egg production. Methods of feeding, culling, keeping records, maintaining egg quality, and selling eggs and fowl. 3 lectures, 1 laboratory. Prerequisite: PI 131

PI 231 Poultry Marketing (4)
Channels through which poultry travels from producer to consumer. Buying, processing, and selling of poultry. Economic, sanitation, management, and merchandising problems involved. 3 lectures, 1 laboratory. Prerequisite: PI 131
PI 232 Egg Marketing (4)
Channels through which eggs travel from producer to consumer. Buying, processing, and selling of eggs. Economic, management, and merchandising problems involved. 3 lectures, 1 laboratory. Prerequisite: PI 131

PI 236 Turkey Raising (4)
Principles and practices in purchasing, brooding, rearing, and selling turkeys for various market demands. 3 lectures, 1 laboratory. Prerequisite: PI 131

DESCRIPTIONS OF COURSES IN VETERINARY SCIENCE

VS 205 Physiology of Domestic Animals (3)
Physiological processes of the more important organs of the animal body. 3 lectures. Prerequisite: Zoo 134

VS 206 Anatomy of Domestic Animals (2)
Laboratory demonstrations and discussions involving the comparative anatomy of the skeleton, musculature and digestive systems of the horse, cow, sheep and pig. 1 lecture, 1 laboratory. Prerequisite: Bio 115

VS 302 Animal Parasitology and Control (3)
Study of factors contributing to problems and control of animal sanitation, disease and parasites. 3 lectures. Prerequisite: Zoo 134
The instruction program of the Fruit Industries Department represents the only four-year college curriculum specializing in citrus production and marketing in the United States. Parallel, but less extensive offerings are given for avocados, other subtropical fruits, and deciduous fruits.

The instruction program, in addition to production, stresses processing, marketing and management. In addition, general education and science courses provide the student with a broad program of liberal and applied education in the arts and sciences to fulfill the requirements of the degree program.

Facilities provide for the field and laboratory application phases of the program. Seventy acres of commercially operated orchards provide students with opportunities to perform and become familiar with cultural practices and procedures. A citrus packinghouse is operated in conjunction with the instruction program enabling students to become familiar with the processing, handling and marketing of citrus fruit.

The citrus and avocado industries represent an aggregate of over 250,000 acres of orchards in California. The annual production value exceeds $200,000,000. Citrus ranks second in the state in tree crop production value. California produces approximately 30 percent of the citrus consumed in the United States.

Employment opportunities for graduates of the Fruit Industries Department are found in orchard operation and management, commercial orchard pest control, fruit tree nurseries, laboratories for public and private agencies, fruit marketing and processing companies, teaching; and with commercial business serving the fruit industries of California. The demand for graduates of this department far exceeds the supply.

Special science options are available to students in this department and are described in the division introductory statement.

CURRICULUM IN FRUIT INDUSTRIES

Freshman

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<td>Citrus Production (FI 121, 122, 123)</td>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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Sophomore

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<td>Avocado Production (FI 222)</td>
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<td>Citrus Diseases (FI 226)</td>
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<td>Farm Power (AE 227)</td>
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California State Polytechnic College

Farm Machinery (AE 221) 4 2
Soils (SS 121) 4
Soil Management (SS 122) 4
Fertilizers (SS 221) 4
Electives 1

17 16 15 1/2

Junior

Citrus and Avocado Marketing (FI 321) 3 3
Fruit Processing and Handling (FI 322) 4 3
Packinghouse Management (FM 323) 4
Irrigation (AE 240) 4
Management Accounting (FM 324) 4
Enterprise Accounting (FM 326) 3
General Inorganic Chemistry (Chem 324, 325) 4 4
Organic Chemistry (Chem 326) 4
Plant Tissue Analysis (Chem 338) 2
Pest Control Materials (SI 231) 4
American Civilization (Am Civ 301) 3
Report Writing (Eng 216) 2 3
Electives 4

17 17 15

Senior

Orchard Management (FI 422) 4
Senior Project (FI 461, 462) 2 2
Undergraduate Seminar (FI 463) 2
American Civilization (Am Civ 302, 303) 3 3
General Psychology (Psy 202) 3
Biochemistry I (Chem 328) 4
Plant Physiology (Bot 322) 3
Genetics (Bio 303) 3
† Literature 3
† Literature or Philosophy 3
Electives 4 5 4

16 16 16

DESCRIPTIONS OF COURSES IN FRUIT INDUSTRIES

FI 121 Citrus Production Laboratory (1)
Field practice in basic orchard skills including tree evaluation, orchard mapping and fall orchard practices. 1 laboratory.

FI 122 Citrus Fruit Production I (4)
Economic importance of the industry, frost protection methods, citrus botany, rootstocks, commercial varieties, pruning, disease control and fruit handling. 3 lectures, 1 laboratory.

FI 123 Citrus Fruit Production II (4)
Propagation and nursery methods, planning and care of orchards, soil management including irrigation, nutrition, cultivation and weed control. 3 lectures, 1 laboratory.

FI 131 Subtropical Fruits (4)
Subtropical fruits including the date, olive, fig, macadamia nut and other selected fruits for commercial planting in California. Climatic and cultural requirements, fruiting and growth habits, varietal characteristics, and propagation. 3 lectures, 1 laboratory. Offered odd-numbered years.

† To be selected from the General Education list.
Agriculture Division

FI 132 Pomology (4)
Commercial deciduous fruits and nuts. Varieties, production areas, seasonal cultural practices and requirements. 3 lectures, 1 laboratory.

FI 136 Small Fruit Production (4)
Specialized berry culture, varieties, production areas, propagation, pest and disease control, cultural practices and harvesting. 3 lectures, 1 laboratory. Offered odd-numbered years.

FI 221 Citrus Pest Control (4)
Recognition of citrus pests, damage and seasonal history. Methods and materials used in control practices. Spray equipment operation and soil fumigation. 3 lectures, 1 laboratory. Prerequisite: Ent 126

FI 222 Avocado Production (4)
Industry development, environmental requirements, variety adaptation, propagation, tree training, cultural requirements, soil management practices and production economics. 3 lectures, 1 laboratory.

FI 226 Citrus Diseases (4)
Diseases of citrus under California conditions, their symptoms and methods of control. 3 lectures, 1 laboratory. Prerequisite: Path 223, FI 122

FI 230 General Fruit Production (4)
Characteristics of the fruit industry of California. Varieties and cultural practices used in selected commercial fruit crops including fruiting and growth habits and propagation. For students other than Fruit Industries majors. 3 lectures, 1 laboratory.

FI 231 Grape Production (4)
Production, processing, and marketing of raisins, table and wine grapes. 3 lectures, 1 laboratory. Offered even-numbered years.

FI 245 Fruit Propagation I (1)
Nursery propagation of fruit plants. Budding, tipgrafting, cuttings, seedbed preparation, care and management of the nursery. 1 laboratory. Prerequisite: Bio 115

FI 246 Fruit Propagation II (1)
Topworking and grafting fruit plants. Types of grafts used, selection of propagating material. 1 laboratory. Prerequisite: Bio 115

FI 321 Citrus and Avocado Marketing (3)
Procedures in marketing citrus and avocados. Organization, importance, and function of cooperative and private marketing corporations in the assembling, processing and distribution of these fruit crops. 3 lectures. Prerequisites: FI 123, 222

FI 322 Fruit Processing and Handling (3)
Physical operations of citrus and avocado packinghouses in relation to harvesting, processing, and packing; fruit storage and diseases; pre-cooling, refrigeration and transportation. 2 lectures, 1 laboratory. Prerequisites: FI 123, 226

FI 323 Packinghouse Management (3)
Management relations in citrus and avocado packinghouse procedures. Regulatory aspects of fruit quality, grades and standards. Use and manufacture of products from citrus and avocados. 2 lectures, 1 laboratory. Prerequisite: FI 322

FI 422 Orchard Management (4)
Factors of management relating to the efficient operation of citrus and avocado orchards. Effect of cultural practices on production and quality of fruit. 3 lectures, 1 laboratory. Prerequisite: Senior standing.
FL 425  Fruit Storage  (2)
Behavior of citrus and avocados under storage conditions. Respiration and internal change determinations of fruit in storage. 1 lecture, 1 laboratory. Prerequisite: Senior standing. Offered odd-numbered years.

FL 461, 462  Senior Project  (2)  (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Prerequisite: Senior standing.

FL 463  Undergraduate Seminar  (2)
Intensive study of the technical and management problems and new developments in the operation and management of fruit orchards. 2 lectures. Prerequisite: Senior standing.

AG 400  Special Problems  (1-2)
For advanced students with sufficient preparation to benefit from individual specialized study. According to the needs and interests of student. Total credit limited to 4 units with not more than 2 units in any one quarter. Prerequisite: Advanced standing.
LANDSCAPE ARCHITECTURE DEPARTMENT

Department Head, Howard O. Boltz
Jere S. French John A. Rinaldi H. Thomas Wilson
Charles R. Haugh Chester A. Volski

The Landscape Architecture curriculum provides a broad range of occupational choice from positions with the many offices engaged in private practice, to civil service opportunities with city, county, state, and federal governments.

The first two years of the curriculum in Landscape Architecture emphasize construction, elementary design, technical and drawing skills, plant materials and science. This background of working with materials, design fundamentals and art, forms a broad base on which the advanced courses build. The curriculum of the last two years enters into progressively more difficult areas of landscape design, construction and planning.

The student specializing in urban planning is provided a program of study and experiences in the many fields of knowledge of concern to the planner; but with an emphasis on planning as a three dimensional design field in which space and people are the prime elements of concern. As an urban or city planner the graduate will understand how to translate the needs of people, and the economic, political, and social forces into a satisfactory, effective urban form.

The 800-acre campus provides a valuable outdoor laboratory for the study of plant material, and design and construction problems as these real site situations fit into the instructional program. Works and offices of landscape architects and planners in the Southern California area provide a wealth of instructional experiences available through field trips to these sites and places.

The curriculum leads to a Bachelor of Science Degree in Landscape Architecture. The program in Landscape Architecture is accredited by the American Society of Landscape Architects and approved by the California Board of Landscape Architects.

CURRICULUM IN LANDSCAPE ARCHITECTURE

<table>
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<tr>
<th>Freshman</th>
<th>F</th>
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<tr>
<td>Landscape Drafting (LA 144, 145)</td>
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<td>Theory of Design (LA 121, 142, 143)</td>
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<td>Basic Concepts of Taxonomy (Bot 116)</td>
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<td>* Plant Materials II (OH 232)</td>
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<tr>
<td>* Electricity and Plumbing (AE 122)</td>
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<td>* Landscape Construction (AE 124, 125)</td>
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<tr>
<td>Fundamentals of Drawing (Art 244)</td>
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<td>Perspective (LA 241, 242)</td>
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<td>Delineation (LA 243)</td>
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<td>Surveying (AE 131, 132)</td>
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<td>Plant Materials I (OH 231)</td>
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† To be selected from the General Education list.
* Students specializing in Urban Planning will delete the courses marked and will substitute 32 units of required courses at the direction of the adviser.
### Junior

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<td>Intermediate Landscape Design (LA 325, 326)</td>
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<td>Landscape Construction Drawing (LA 337, 338)</td>
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<td>Landscape Construction Drawing (LA 339)</td>
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<td>Planting Design (LA 327, 359)</td>
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<td>Mechanics and Strength of Materials (LA 348, 349)</td>
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<td>Business Law (Bus 301)</td>
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<td>Public Speaking (Sp 200)</td>
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<td>General Soils (SS 230)</td>
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<td>Management Accounting (FM 324)</td>
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### Senior

<table>
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<td>History and Literature of Landscape Architecture (LA 424, 425)</td>
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<td>Senior Project (LA 461, 462)</td>
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<td>Undergraduate Seminar (LA 463)</td>
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<td>Contracts, Specifications and Estimating (LA 331, 332)</td>
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<td>American Civilization (Am Civ 302, 303)</td>
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<td>Native Plant Material (OH 336)</td>
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<tr>
<td>Turf Maintenance and Management (OH 333)</td>
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</tbody>
</table>

### Electives

- *17 17 15*

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### DESCRIPTIONS OF COURSES IN LANDSCAPE ARCHITECTURE

**LA 121, 142, 143**  
Theory of Design  (2)  (2)  (2)

- Studies in form, space, color, and materials, and their relation to three-dimensional problems. LA 121: 1 lecture, 1 laboratory. LA 142, 143: 2 laboratories.

**LA 144, 145**  
Landscape Drafting  (2)  (2)

- Drafting techniques and standards, progressing from tracings to light-construction working drawings. 2 laboratories.

**LA 224**  
Principles of Landscape Design  (4)

- Basic principles of design and the application of these principles in the solving of landscape design problems. For non-majors. 2 lectures, 2 laboratories.

**LA 225**  
Landscape Design of Small Homes  (4)

- Adaptation of landscape design principles to the garden layout of residential properties. For non-majors. 2 lectures, 2 laboratories.

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* Students specializing in Urban Planning will delete the courses marked and will substitute 32 units of required courses at the direction of the adviser.

† To be selected from the General Education list.
Agriculture Division

LA 227, 228, 229 Basic Landscape Design (3) (3) (3)
Fundamental concepts in the analysis and solution of site problems. 1 lecture, 2 laboratories. Prerequisite: LA 143, 145

LA 241, 242 Perspective (2) (1)
Mechanical and sketching perspective. 2 laboratories, 1 laboratory. Prerequisite: LA 145 or ME 121

LA 243 Delineation (2)
Two-dimensional representation of three-dimensional subject using different media which enable a student to express his ideas visually. 2 laboratories. Prerequisite: LA 241, Art 244

LA 321 Planning I (3)
Town planning theory; major elements in the subdivisions, shopping centers, parks, zoning. 1 lecture, 2 laboratories. Prerequisite: LA 229

LA 322 Planning II (3)
Problems characteristic of the large city including traffic, transportation, redevelopment, recreation, zoning. 1 lecture, 2 laboratories.

LA 323 Planning III (3)
Problems arising in suburban areas adjacent to cities and arterial highways. 1 lecture, 2 laboratories.

LA 324, 325, 326 Intermediate Landscape Design (4) (4) (4)
The application of design concepts and principles to increasingly more difficult problems involving the total range of physical environment. 1 lecture, 3 laboratories. Prerequisite: LA 229, 243

LA 327, 359 Planting Design (3) (2)
The association of plant materials according to form, color, texture and culture; their grouping, arranging, and relationship to structural materials. 2 lectures, 1 laboratory; 2 laboratories. Prerequisite: OH 231, 232, LA 229, or LA 225

LA 337, 338, 339 Landscape Construction Drawing (3) (3) (3)
Landscape construction problems involving the formulation and preparation of plans for grading, drainage, staking, reference and lighting, planting, irrigation, construction details, structures, and other working drawings; relationship to specifications and contract documents. Preparation of a complete set of landscape construction drawings and documents. 1 lecture, 2 laboratories. Prerequisite: Math 112, LA 145, AE 122, 132

LA 348, 349 Mechanics and Strength of Materials (1) (1)
Basic forces and their components. Physical properties of construction materials. Shear and bending moment diagrams. Sizing of wood structural members. 1 lecture. Prerequisite: Math 112, PSc 102

LA 424, 425 History and Literature of Landscape Architecture (3) (3)
The relationship of religious, economic, and social conditions, topography and climate to the landscape architecture of the major nations at various times and places. The contributions of the literature and landscape designers of note to the field of landscape architecture. 2 lectures, 1 laboratory.

LA 431, 432, 433 Advanced Planning (4) (4) (4)
Methods and procedures of master planning in large scale environmental development. Attention to complex regional and metropolitan planning problems. 1 lecture, 3 laboratories. Prerequisite: LA 323

LA 434, 436 Advanced Landscape Design (4) (4)
A study of the relationship of buildings and building groups to irregular topography and the further long-range growth and development of the land and elements thereon. 1 lecture, 3 laboratories. Prerequisite: LA 326

12—14191
LA 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

LA 463 Undergraduate Seminar (2)
Methods and developments, ethics, office practices and procedures in the profession. 2 lectures.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student, total credit limited to 4 units with not more than 2 units in any one quarter.
ORNAMENTAL HORTICULTURE DEPARTMENT

Department Head, Oliver A. Batcheller
James L. Degen James M. Griffin Tom Y. Yoshikawa

Ornamental horticulture with its many related phases continues to be among the most rapidly growing industries in California. It has doubled in size in the last ten years, and indications are that this growth will continue. This department provides emphasis in Ornamental Horticulture and Park Administration.

The Nursery Operations Option prepares men and women for positions in nursery operations and marketing and in the floriculture industry. It provides an excellent background for the preparation of teachers in horticultural science as well as for positions with state and county arboretums.

The Park Administration Option prepares men and women for positions in the park and recreation areas including the installation, operation and management of both public and private enterprises. A further area of emphasis is that of landscape contracting which includes preparation in estimating, installation, and supervision.

Through field trips to surrounding areas students have ready access to the greatest variety and number of horticultural enterprises in the United States. The well-landscaped Kellogg and Voorhis campuses offer excellent opportunities for practical application of principles and methods used in the industry. In addition to the facilities in the new Agricultural Science Building, the department has 12,000 square feet of greenhouse space, 5,000 feet of lath and saran shade and five acres of growing grounds. The close alliance with the Landscape Architecture Department gives opportunity for additional training in landscape design.

Through the department's unique project program, students may grow and market their own nursery stock, cut flowers, or potted plants, thus adding significantly to their educational experience.

Special science options are available to students in the department and are described in the division introductory statement.

CURRICULAR OPTIONS

Nursery Operation
The Nursery Operation Option emphasizes preparation for production and management of both retail and wholesale nurseries.

Park Administration
The Park Administration Option emphasizes preparation for development, operation, and management of both public and private parks.

CURRICULUM IN ORNAMENTAL HORTICULTURE

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<th>Freshman</th>
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<td>Basic Horticultural Skills (OH 131)</td>
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<td>Basic Mathematics (Math 101, 112)</td>
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<td>Landscape Construction (AE 124, 125)</td>
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### Sophomore

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<td>Plant Materials III (OH 233)</td>
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<td>Principles of Economics (Ex 201, 202)</td>
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<td>Pest Control Equipment (AE 233)</td>
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<td>Soils (SS 121)</td>
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<td>General Plant Pathology (Path 223)</td>
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<td>Fertilizers (SS 221)</td>
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<td>General Psychology (Psy 202)</td>
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### NURSERY OPERATIONS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

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<td>LA 224 Principles of Landscape Design</td>
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<td>OH 336 Native Plant Materials</td>
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<td>OH 323 Greenhouse Operations</td>
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<td>FM 326 Enterprise Accounting</td>
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<td>Chem 326 Organic Chemistry</td>
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<td>Bio 303 Genetics</td>
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<td>Chem 328 Biochemistry I</td>
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<td>ABM 305 Advertising and Promotion of Agricultural Products</td>
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### PARK ADMINISTRATION OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

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<td>LA 228, 229 Basic Landscape Design</td>
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<tr>
<td>Junior</td>
<td>PA 329 Arboriculture</td>
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<td>SS 122 Soil Management</td>
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<td>PSc 329 Geology</td>
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<td>PA 335 Park Management</td>
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† To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN ORNAMENTAL HORTICULTURE

OH 121 Nursery Operations (4)
The nursery industry in California; the wholesale grower, the jobbers, the retail nursery, the garden center, and other nursery outlets. A study of nursery location, arrangement, organization, and operation. 3 lectures, 1 laboratory.

OH 131 Basic Horticultural Skills (4)
The basic skills of horticulture. Techniques and plans for their use in the gardening and nursery trade. 3 lectures, 1 laboratory.

OH 222 Specialized Plant Propagation (4)
Commercial specialized propagation including all types of grafting, budding, layerage, inarching, separations, divisions, and cuttings. Flask seeding. Use of the college facilities and frequent field trips to wholesale growers. 3 lectures, 1 laboratory. Prerequisite: OH 131, 231, Bot 120.

OH 223 Basic Floral Design (3)
Introduction to basic floral design, covering preparation of flowers, color harmony, and design principles. 1 lecture, 2 laboratories. Offered odd-numbered years.

OH 231, 232, 233 Plant Materials I, II, III (4) (4) (4)
The study of trees, shrubs, vines and herbaceous plants used in California; shown during their best growing season. This includes: identification, habit of growth, cultural requirements and landscape use. 3 lectures, 1 laboratory. Prerequisite: Bot 120.

OH 323 Greenhouse Operation (4)
The operation and management of forcing structures. Growing of commercial cut-flowers under glass, lath, cloth, and in the open. Experience in growing and management. 3 lectures, 1 laboratory. Prerequisite: OH 222, 231.

OH 327 Diseases of Ornamental Plants (4)
The effect of diseases on ornamental plants found in nurseries, greenhouses, flowers, and identification, control, and prevention. Field trips to production areas to study field conditions. 3 lectures, 1 laboratory. Prerequisite: Bio 115, 145, Path 223.

OH 356 Native Plant Materials (3)
Native California plants suitable for landscape purposes. Their identification, habits of growth, cultural requirements, and landscape use. 2 lectures, 1 laboratory.

OH 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

OH 463 Undergraduate Seminar (2)
An open forum of senior students in which the latest developments, practices, and procedures are discussed. Each student is responsible for the development and presentation of a topic in his chosen field. 2 lectures.

AG 400 Special Problems (1-2)
For advanced students with sufficient preparation to benefit from specialized study. According to needs and interest of student; total credit limited to 4 units with not more than 2 units in any one quarter.
DESCRIPTIONS OF COURSES IN PARK ADMINISTRATION

PA 329 Arboriculture (3)
Care and management of specimen ornamental trees. Cavity work, bracing, cabling and pruning, disease and pest control. Practice in the use of lines and in climbing safety practices in tree work. 2 lectures, 1 laboratory. Prerequisite: OH 131

PA 331, 332 Contracts, Specifications, Estimating (4) (4)
Practice in supervising men and applying approved techniques in landscape construction. Cost finding and estimating, contract and specification writing, and legal aspects of the landscape industry. 3 lectures, 1 laboratory.

PA 333 Turf Management (4)
Practice in the maintenance and management of turf areas, including such specialized areas as golf greens, athletic fields, and park lawns. 3 lectures, 1 laboratory. Prerequisite: OH 131, SS 221

PA 335 Park Management (4)
Planning, scheduling and operational techniques applicable to the management of city street trees and to public and private parks. 3 lectures, 1 laboratory. Prerequisite: OH 131
RELATED AGRICULTURAL COURSES

DESCRIPTIONS OF COURSES IN AGRICULTURAL ENGINEERING

Chairman, Haven Q. Conard
Donald E. Kibbe          Dudley R. Smith          Dwight C. Thompson

AE 121 Carpentry and Concrete (2)
Elements of carpentry and concrete work as applied to farm buildings and structures, concrete walks, floors, foundations, and concrete block construction. Use of both hand and power equipment. 1 lecture, 1 laboratory.

AE 122 Electricity and Plumbing (2)
Rural wiring practices, types of material used, fractional horsepower electric motor installation, soldering, water pipe selection and fitting. 1 lecture, 1 laboratory.

AE 123 Welding (2)
Elements of arc and acetylene welding of mild steel; flat horizontal, vertical, and overhead positions. Arc and acetylene cutting. Brazing and hard-facing. 1 lecture, 1 laboratory.

AE 124, 125 Landscape Construction (2) (2)
Instruction and practice in the construction techniques applicable to landscaping. 1 lecture, 1 laboratory.

AE 131 Farm Surveying (2)
Care and use of surveying equipment. Land measurement. Differential leveling. Laying out contours and ditch lines. Writing and interpreting field notes. 1 lecture, 1 laboratory. Prerequisite: Math 103 or 112

AE 132 Applied Farm Surveying (2)
Methods of plane table mapping, use of contour maps, planimeter and profiles in calculating earth yardage and reservoir capacity. Borrow pit and land leveling problems. 1 lecture, 1 laboratory. Prerequisite: AE 131

AE 221 Farm Machinery (2)
Basic principles of machines. Materials and construction. Lubrication and maintenance. Selection, operation, and adjustment of seed bed preparation equipment. Seeding, planting, harvesting, and commercial fertilizer equipment. 1 lecture, 1 laboratory. Prerequisite: AE 241

AE 227 Farm Power (2)
Internal combustion engine fundamentals, both gasoline and diesel. Troubleshooting, overhauling, and making major adjustments and repairs. 1 lecture, 1 laboratory. Prerequisite: AE 241, Math 101 or 102

AE 233 Pest Control Equipment (3)
Principles of operation of the various types of spraying, dusting, and fumigation equipment used by the structural and agricultural pest control industries. Care, adjustment, and repair of this equipment. 2 lectures, 1 laboratory. Prerequisite: AE 122

AE 240 Irrigation (4)
Fundamental principles and practices of irrigation. Soil-moisture relationships, water measurement, methods of irrigation, crop requirements, farm irrigation structures, pumps and pumping, and problems of the irrigation farmer. 3 lectures, 1 laboratory. Prerequisite: AE 131, SS 121

AE 241 Farm Tractors (2)
Field and shop practice in the operation, service, and adjustment of the modern farm tractor; including both wheel and track types with gasoline and diesel power units. 1 lecture, 1 laboratory.
AE 244 Farm Equipment Projects (1-3)
Construction of trailers and other implements. 1 laboratory per unit. Prerequisite: AE 121, 123

DESCRIPTIONS OF COURSES IN AGRICULTURE

Ag 311 Fundamentals of Agricultural Science (3)
Overview of the plant and animal industries. Principles and practices in producing, processing, and distributing food and fiber. Concepts designed particularly for the discriminating consumer. 3 lectures.

Ag 521 Curriculum and Methods in Agriculture (3)
Survey methods, principles and practices in determining course objectives, content and teaching calendar. Methods, devices and materials particularly adapted for use by the beginning teacher in general agriculture classes on secondary level. 3 lectures.

Ag 590 Seminar in Agriculture (1-6)
Current findings and research problems in the field of agriculture and their application to the industry. Maximum of six units may be earned. 1 to 3 lectures. Prerequisite: Graduate standing.
THE ENGINEERING DIVISION
Aerospace Student Reading "Moment," "Lift," and "Drag" Loads
On Subsonic Wind Tunnel Balance

Performing Circuit Analysis in the Laboratory to Verify a Classroom Solution

Architect's Concept of the New Engineering Center
THE ENGINEERING DIVISION

Engineering involves the application of science and mathematics in the solution of technical and economic problems. Typically, an engineer utilizes discoveries of the scientist to produce something beneficial to mankind. Four out of five positions in the scientific-technical fields in the United States are in either engineering or technical administration.

Cal Poly’s instructional philosophy emphasizes laboratory and field work with constant interplay between general principles and practical applications. This is often called the “learn by doing” philosophy. The whole plan adds “know how” to “know why.” An extra dimension is added to the more typical engineering programs; that is, learning to apply the theory acquired in basic core courses.

Cal Poly not only places heavy emphasis on excellence in the technical aspects of the preparation for Bachelor of Science Degrees in Engineering, but also makes a particular point of preparing a student for his overall role as a member of the engineering profession. Basic fundamentals and principles are taught and used in the solution of industrial problems.

The Kellogg Campus offers five engineering majors which lead to the Bachelor of Science Degree. These are: Aerospace, Civil, Electronic, Industrial, and Mechanical Engineering.

The early introduction of engineering courses in the freshman year and their continuation throughout the four years permits a longer period of maturation. The Cal Poly program also gives the advantage of early motivation, more complete orientation and greater understanding and familiarization with the field. It provides for early employability in technical work in industry. A student learns at an early stage if the particular field he has chosen is one for which he is fitted. The early emphasis on manufacturing laboratories and shop operations develops an engineer capable of practical design.

The curriculum at Cal Poly involves relatively equal amounts of basic mathematics and science, engineering core courses and general education in the humanistic-social field. It is one that prepares students to meet the demands of the nation’s changing industries by applying fundamentals of their profession to the engineering techniques of the present and future.

The program is one of analysis and design, instrumentation and synthesis. Graduates work in design development, supervision, systems, applied research, test engineering, production and manufacturing, methods engineering, sales and field engineering. The courses in manufacturing processes enable students to learn the capabilities and limitations of these processes, so that they as engineers make the best use of this knowledge in their work and planning.

A distinguishing feature of the Cal Poly graduate is his readiness to take his place in industry and begin producing for his employer in his initial period of employment, and yet be well prepared for future growth and development. Cal Poly graduates have been accepted at leading graduate schools across the country.

The State of California has shown its confidence in the Kellogg Campus engineering program by providing a ten million dollar plant with some of the finest facilities to be found in the nation for undergraduate engineering education. The engineering faculty members typically have more than ten years of professional experience as successful practicing engineers, and in addition, advanced education. The broad acceptance of the Cal Poly engineering program is demonstrated by the multiplicity of opportunities and offers to engineering graduates. During the last several years there has been an increasing number of companies coming to the campus seeking engineers.

There are cooperative work-study programs for senior students with leading local industries. Many of the major firms have made contributions of gifts of equipment, scholarships, awards and other forms of aid. The campus has become a center for professional engineering societies meetings. A close liaison is maintained with the profession and industry.
Since a typical engineering education involves several years of college science and mathematics, the high school student or junior college student contemplating the engineering profession would do well to take a strong scientific program involving mathematics, physics, chemistry and English, and if possible shop, engineering drawing and related courses.

AEROSPACE ENGINEERING DEPARTMENT

Acting Department Head, Rodney D. Sutherland

George R. Graves

Horatio O. Morgan

Alan T. Roper

Each of the four years work in the Aerospace Engineering curriculum is devoted to careful study of basic engineering theory. These basic principles have a solid foundation in mathematics, physics, mechanics, fluids, thermodynamics and design. As the theory is studied, it is applied in the laboratory through the media of laboratory experiments, demonstrations and testing.

Applied technology courses ensure that the student not only understands the basic fundamentals of engineering, but can also put them to work in the shop. The mathematics and physics courses are very carefully correlated with the engineering courses so that they can be readily understood as well as applied.

Graduates of the Aerospace Engineering Department find employment in many varied fields associated with the manufacture and flight of military and commercial missiles, space vehicles and aircraft. Their employment may be in aerodynamics, propulsion systems, aerospace testing and research, stress analysis, flight test engineering and design groups. Graduates are employed by aerospace vehicle and component manufacturers, airlines, government test bases, research laboratories, and propulsion unit manufacturers.

It is recommended that the high school student planning a career in Aerospace Engineering take a balanced program including mathematics, physical science, mechanical drawing and shops. The junior college student planning to transfer into this department would do well to meet, insofar as possible, the requirements of the Aerospace curriculum.

The department occupies new facilities consisting of an Aerospace Laboratory, wind tunnel, structural test laboratory, aircraft construction shop and general laboratories. The laboratories are equipped with the latest instruments and test equipment available for the study and investigation of most phases of aerospace engineering. The facilities and equipment coupled with the required applied shop and laboratory courses, provide an opportunity for the student to gain a knowledge of industrial practices as well as an excellent theoretical background.

Aerospace engineering students have the opportunity to join the student branch of the American Institute of Aeronautics and Astronautics, a national society organized for the advancement of aerospace knowledge.

CURRICULUM IN AEROSPACE ENGINEERING

Freshman

Aerospace Engineering Fundamentals (Aero 124, 125, 126)................. 3 3 2
Automatic Programming for Digital Computers (Math 221)................. 1
Engineering Drafting (ME 121, 122).................................... 2 2
Descriptive Geometry (ME 125)........................................... 2
Metal Processes (MP 142, 144)........................................... 1
Welding Survey (WE 144)................................................... 1
Production Welding Processes I (WE 145)................................... 1
College Algebra and Trigonometry (Math 117)............................... 5
Analytic Geometry and Calculus (Math 118, 201)............................ 5
General Physics (Phys 131, 132).......................................... 4
Freshman Composition (Eng 104, 105, 106)................................ 3
Health Education (PE 107).................................................. 2
Physical Education (PE 141)............................................... ½ ½ ½

17 ½ 17 ½ 17 ½
# DESCRIPTIONS OF COURSES IN AEROSPACE ENGINEERING

**Aero 124** Aerospace Engineering Fundamentals (3)

Application of basic engineering fundamentals to aircraft and missile systems. Basic theory of flight. Dimensional analysis and scientific notation. Slide rule and graphing techniques. Report writing fundamentals. Pressure, temperature and basic aerospace experiments. Wind tunnel familiarization. 1 lecture, 2 laboratories. Concurrent: Math 117

**Aero 125** Aerospace Engineering Fundamentals (3)

Basic aerospace structures. Flight stability, weight and balance methods. Basic aerospace experiments and structures testing. Weight and balance experiments. 1 lecture, 2 laboratories. Prerequisite: Aero 124. Concurrent: Math 118

† To be selected from the General Education list.
Aero 126 **Aerospace Electrical and Propulsion Systems** (2)

Basic theory of rockets and introduction to space flight. Angular velocity experiments, aircraft engine testing. Environmental testing procedures. 1 lecture, 1 laboratory. Prerequisite: Aero 125. Concurrent: Math 201

Aero 155 **Aircraft Construction Laboratory** (1)

Fundamentals of sheet metal fabrication of aircraft structures and components. Principles of riveting, fastening and joining aircraft structures. 1 laboratory. Prerequisite: Math 117

Aero 156 **Aerospace Construction Laboratory** (1)

Assembly of sheet metal components. Corrosion protection; coatings, plating, painting. Special fastening and joining techniques. Resistance welding techniques. Plastics and reinforced fiberglass. 1 laboratory. Prerequisite: Aero 155

Aero 205 **Aircraft Strength of Materials** (3)

Aircraft materials properties. Tension, compression, bending, torsion and shear flow in statically determinate structures. Relationship of shear, moment, slope and deflection of beams. Bending and shear stresses in simple beams. Thermal stresses. 3 lectures. Prerequisite: Aero 126, ME 211. Concurrent: Math 202

Aero 206 **Aircraft Strength of Materials** (4)

Beam deflections. Restrained, continuous and curved beams. Columns. Failure under combined and fluctuating stresses. Fatigue and stress concentrations. Determination and testing of the physical properties of materials used in aircraft. Effect of heat treatment on material properties. Use of the SR-4 rosette for determining principal strains. 3 lectures, 1 laboratory. Prerequisite: Aero 205, ME 212. Concurrent: Math 203

Aero 209 **Flight Dynamics** (2)

Work, energy and impulse-momentum relationships. Impact. Application to particle and rigid body motion. Introduction to Lagrange equations of motion. Introduction to vibrations. Applications in aircraft, missile and rocket fields. 2 lectures. Concurrent: Math 316

Aero 223 **Aerospace Hydraulic Systems** (3)


Aero 240 **Additional-Engineering Laboratory** (1-2)

Elective project work. Total credit limited to four units, with not more than two units in any one quarter. 1 or 2 laboratories. Prerequisite: Permission of instructor.

Aero 247 **Aerospace Design and Layout** (2)


Aero 248 **Aerospace Design and Layout** (2)

Design of machined parts, castings, forgings, extruded and rolled shapes and assemblies. Calculations and use of handbooks. 2 laboratories. Prerequisite: Aero 247

Aero 249 **Aerospace Design and Layout** (2)

Design of aerospace structural assemblies. Fastener and process callout. Design for thermal considerations. Joining dissimilar structural components. 2 laboratories. Prerequisite: Aero 248

Aero 301 **Aerodynamics** (3)

Introduction to incompressible flow aerodynamics. Equations of continuity, momentum and energy. Introduction to viscous flow. Navier-Stokes equations. 3 lectures. Prerequisite: Aero 223. Concurrent: Math 318
Aero 302 Aerodynamics (3)
Potential flow, vorticity, circulation, sources and sinks, two dimensional wing theory, effect of flaps, three dimensional wing theory, finite span wing, vortex systems. 3 lectures. Prerequisite: Aero 301

Aero 304 Aerodynamic Heating (3)
Heating of aerodynamic surfaces due to supersonic and hypersonic velocities. Application of analog and digital computer techniques to transient heat conduction problems. Investigation of radiative cooling. Re-entry heating. 3 lectures. Prerequisite: Aero 223, Math 316

Aero 305 Introduction to Gas Dynamics (3)
Real gas equation of state and thermodynamic properties. Kinetic theory, polytropic processes, Maxwell’s equations, combustion. Applications from the aerospace field. 3 lectures. Prerequisite: Aero 304, ME 301

Aero 309 Flight Vibrations (3)

Aero 327 Aircraft Stress Analysis (3)
Analysis of aircraft and missile structural components; combined stress and failure theories; column and sheet-stringer panel analysis. Shear-resistant and tension-field beams; single and multicell box beams, unsymmetrical and tapered beams. Bulkhead and cutout analysis. 2 lectures, 1 laboratory. Prerequisite: Aero 206. Concurrent: Math 316

Aero 328 Aircraft Stress Analysis, and Structures Laboratory (3)

Aero 347 Experimental Design Analysis (2)

Aero 400 Special Problems for Advanced Undergraduates (1-2)
Individual project work for senior students. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories. Prerequisite: Approval of Department Head.

Aero 401 Propulsion Systems (3)
Analysis of aircraft and missile engines with respect to thrust and energy utilization. Thermodynamic processes. One-dimensional flow; isentropic, variable area duct, normal shock, constant area duct with friction, frictionless constant area duct with heat transfer. Two-dimensional flow. 3 lectures. Prerequisite: Aero 302, 305. Concurrent: Aero 404

Aero 402 Propulsion Systems (3)
Fuel burning performance of aircraft and missile power plants. Thermodynamic analysis, and structural and mechanical requirements. Emphasis on turboprop, turbojet, ramjet and liquid and solid-fuel rocket engines. 3 lectures. Prerequisite: Aero 401
Aero 403 Rocket Propulsion (3)

Aero 404 Supersonic Aerodynamics and Wind Tunnel Testing (4)
Compressible flow about bodies and wings. Solution of wave equations; oblique shock, Prandtl-Meyer expansion. Small-perturbation, shock-expansion, and slender body theory. Finite span wings. Three-dimensional flow approximations. Operation of the supersonic wind tunnel. Methods of instrumentation. Testing of high speed models. 3 lectures, 1 laboratory. Prerequisite: Aero 302

Aero 405 Aerodynamics (3)
Performance analysis of aircraft and missiles. Variation in performance with change of configuration. Introduction to stability and control, static and dynamic stability. 3 lectures. Prerequisite: Aero 404

Aero 408 Advanced Aircraft Structural Analysis (3)
Indeterminate structures, frame analysis, treatment of plates and shells, shear lag and deformation, effect of skin cutout, application of structural theory to the design of aircraft components. 3 lectures. Prerequisite: Aero 328

Aero 412 Missiles (3)
Extension of aeronautical engineering principles to rockets and missiles; theory of design; propulsion systems and controls; flight characteristics and guidance. 3 lectures. Prerequisite: Aero 405

Aero 413 Space Technology (3)
Basic principles of astronautics; escape velocities and orbital speeds, trajectories. Satellite vehicles, descent from satellite orbits. Interorbital transport techniques. Physical factors of space environment. 3 lectures. Prerequisite: Aero 401, 405

Aero 444 Advanced Aerospace Design (2)
Design of aircraft components and systems. Static systems, design parameters. Design verification by written analysis. 2 laboratories. Concurrent: Aero 401, 404

Aero 445 Advanced Aerospace Design (2)
Design of aircraft, missile and rocket system components. Dynamic systems, design parameters. Design verification by written analysis. 2 laboratories. Prerequisite: Aero 444

Aero 446 Advanced Aerospace Design (2)
Advanced design of aircraft, missile, rocket systems and components. Design verification by written analysis. 2 laboratories. Prerequisite: Aero 445

Aero 457, 458 Aerospace Measurements Laboratory (2) (2)
Use of laboratory instruments to develop the technique of obtaining engineering measurements. Special assigned problems in the field of aerospace engineering. 2 laboratories. Prerequisite: EL 223, Aero 347

Aero 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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, EL 223, Aero 347

Aero 463 Undergraduate Seminar (2)
Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments. 2 lectures. Prerequisite: Aero 462
The program in Civil Engineering prepares graduates to enter this profession in design, construction, or maintenance capacities on such projects as freeways, highways, major buildings, dams, bridges, aqueducts, pipelines, airports, water supply, waste disposal, flood control, and urban development.

Graduates are employed by governmental agencies at federal, state, and municipal levels. Many are employed by contractors and private consulting firms. Some enter employment with manufacturers as maintenance and sales engineers. Others enter teaching, research, materials testing, city planning, and administrative fields.

Many projects, including freeways, water supply and control facilities, waste disposal units, and new housing developments are in progress in the immediate area. In addition, new construction on the campus offers excellent opportunities for demonstration as well as numerous field and practical applications of classroom and laboratory assignments.

CURRICULUM IN CIVIL ENGINEERING

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<td>Introduction to Civil Engineering (CE 121, 122)</td>
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<td>Elementary Surveying (CE 134)</td>
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<td>Advanced Surveying (CE 135)</td>
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<td>Route Surveying (CE 136)</td>
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<td>Engineering Drafting (ME 121, 122)</td>
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<td>Descriptive Geometry (ME 125)</td>
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<td>Welding Survey (WE 144)</td>
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<td>College Algebra and Trigonometry (Math 117)</td>
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<td>Engineering Law, Contracts and Specifications (CE 203)</td>
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<td>Highway Engineering, Planning (CE 221)</td>
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<td>Highway Engineering, Traffic (CE 222)</td>
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<td>Highway Engineering, Structural (CE 226)</td>
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<td>Civil Engineering, Drafting (CE 241)</td>
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<td>Engineering Statics (ME 211)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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* On leave of absence.
### Junior

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<td>Engineering Soil Mechanics (CE 323)</td>
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<td>Principles and Practices of Electrical Engineering (EE 231, 232)</td>
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### Senior

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### DESCRIPTIONS OF COURSES IN CIVIL ENGINEERING

**CE 121 Introduction to Civil Engineering (2)**

The scope and diversity of civil engineering educational and professional activities, technical and social responsibilities of the civil engineer, engineering method of problem analysis and oral and written communication. 1 lecture, 1 laboratory.

**CE 122 Introduction to Civil Engineering (2)**

The organization and functions of civil engineering design and construction groups; construction methods, equipment and safety. 1 lecture, 1 laboratory.

**CE 134 Elementary Surveying (3)**

Use and care of surveying instruments, fundamental surveying methods, traverse measurements, and area computations. 1 lecture, 2 laboratories. Prerequisite: Trigonometry.

**CE 135 Advanced Surveying (3)**

Adjustments. Elements of topographic, hydrographic, geodetic surveying. Precise equipment and control surveys, city and land surveys. Astronomical observations. State plane coordinates. 1 lecture, 2 laboratories. Prerequisite: CE 134

**CE 136 Route Surveying (3)**

Route location and layout. Simple, transition and vertical curves. Earthwork computation. Introduction to electronic and photogrammetric methods. 1 lecture, 2 laboratories. Prerequisite: CE 135

*T To be selected from the General Education list.
CE 202 Economics of Engineering Decisions (3)
Principles governing the economic aspects of engineering decisions. Retirement and replacement studies. Effect of taxes on engineering decisions. 3 lectures.

CE 203 Engineering Law, Contracts & Specifications (3)
Basic principles of law and contract documents as applied to civil engineering practices; varieties of construction contracts; relationship of owner, engineer and contractor. 3 lectures.

CE 221 Highway Engineering, Planning (2)
Highway administration, finance and planning. Geometric design, drainage, location. 1 lecture, 1 laboratory. Prerequisite: CE 136

CE 222 Highway Engineering, Traffic (2)
Traffic surveys and routing studies. Parking and public transit planning. Driver and vehicular characteristics. Traffic control and accident prevention. 1 lecture, 1 laboratory. Prerequisite: CE 221

CE 226 Highway Engineering, Structural (2)
Design of rigid and flexible pavements. Soil stabilization. Highway construction and maintenance. 1 lecture, 1 laboratory. Prerequisite: CE 222

CE 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.

CE 241 Civil Engineering Drafting (2)
Structural, topographic, plan and profile and survey drawing practices. Line and lettering work, use of drafting machines and office practices are stressed. 2 laboratories. Prerequisite: ME 122

CE 304 Elementary Structural Analysis (3)
Analysis of statically determinate beams, trusses and three-hinged arches. Graphical and analytical methods of solution. Influence lines. 3 lectures. Prerequisite: CE 241, ME 219

CE 305 Statically Indeterminate Structures (3)
Analysis of statically indeterminate structures by analytical and graphical methods. 3 lectures. Prerequisite: CE 304

CE 306 Steel Structures Design (3)
Analysis and design of steel members and their connections. Study of applicable steel design codes and specifications. 3 lectures. Prerequisite: CE 305

CE 323 Engineering Soil Mechanics (3)
Structure, identification and classification of soil for engineering purposes. Determination of physical properties of soils by laboratory experiments including consolidation, shearing strength, permeability. Application to problems. 2 lectures, 1 laboratory. Prerequisite: CE 342, ME 249

CE 332 Hydraulic Engineering (3)
Principles of hydrostatics, hydrokinetics, and hydrodynamics. Problems involving dam analyses, flow in open channels, flow through pipes, pipe networks, pump-pipe-reservoir systems, surge tanks, water hammer, and turbines. 2 lectures, 1 laboratory. Prerequisite: ME 311

CE 333 Hydrology (2)
Introduction to the hydrologic cycle. Measurement of precipitation, statistical methods for analysis of data, ground water, flood mitigation, state-discharge relations, stream flow and runoff computations, reservoir management. 1 lecture, 1 laboratory. Prerequisite: CE 332
CE 342 Concrete Mixture Design (2)
Study of concrete materials. Methods of design and control of concrete mixtures. Tests for acceptability of materials. Responsibilities and position of the inspector. 2 laboratories. Prerequisite: ME 249

CE 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter, 1 or 2 laboratories.

CE 402 Civil Engineering Computer Applications (1)
Application of digital computer techniques to the solution of civil engineering problems. 1 lecture. Prerequisite: Math 117

CE 421 Reinforced Concrete Design (3)
Analysis and design of reinforced concrete structures. 2 lectures, 1 laboratory. Prerequisite: CE 306

CE 423 Substructure Design (3)
Analysis and design of foundations and substructures. 2 lectures, 1 laboratory. Prerequisite: CE 421

CE 427 Photogrammetry (3)
Interpretation of aerial photographs. Stereoscopy. Application of aerial surveying to engineering problems, mapping. 2 lectures. 1 laboratory. Prerequisite: CE 133

CE 431 Water Supply Engineering (3)
Economic design of a water supply system. Statistics for determination of demand, collection, storage, water treatment and quality control, the physical characteristics of water, and distribution. 2 lectures. 1 laboratory. Prerequisite: CE 333, Chem 322, Bio 110

CE 432 Water Quality Engineering (3)
Characteristics of waste waters; analysis and treatment of sewage and industrial wastes. Basic design of waste treatment plants and sewerage systems. 2 lectures, 1 laboratory. Prerequisite: CE 431

CE 433 Timber Structures Design (3)
Analysis and design of timber members and their connections. 1 lecture, 2 laboratories. Prerequisite: CE 421

* CE 434 Industrial and Radioactive Wastes (3)
Source of industrial water pollutants; processes for prevention and treatment of industrial wastes. Elements of radioactive wastes and disposal methods. 2 lectures, 1 laboratory. Prerequisite: CE 432

CE 442 Masonry Design (3)
Design of brick and block structures. Emphasis on seismic analysis of these structures. 1 lecture, 2 laboratories. Prerequisite: CE 421

CE 443 Flexible Pavement Design Laboratory (2)
A study of asphalt materials. Methods of design, control and testing of flexible pavement asphaltic mixtures. 2 laboratories. Prerequisite: CE 323

CE 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their field of employment. Presentation of project in a formal report. 120 hours minimum per total senior project. Prerequisite: Senior standing.

CE 463 Undergraduate Seminar (2)
Seminar discussion of new developments, policies, practices and procedures. Preparation and presentation by each student of an engineering development in his chosen field. 2 lectures. Prerequisite: Senior standing.

* To be offered when course enrollment justifies.
The program in electronic engineering prepares students for the application of science in that branch of engineering concerned, among its many fields, with communications, electronic control of mechanical and electrical operations, computer design and application, microwave theory and techniques, and electrical metrology.

Graduates of this department are employed by a very broad cross section of industry, utilities, governmental agencies, sales organizations, and educational institutions. The work of these graduates is concerned chiefly with application engineering, design and development, test and evaluation, technical operations, and engineering sales. The broad use of electronic devices by State and Federal agencies, business offices, military installations, and the home is increasing the opportunities for field engineering and sales employment in technical services.

The four-year course is planned so that the student starts in his freshman year with a series of courses in electronic technology. At the same time, the student is also preparing himself in mathematics and physics for the more advanced engineering courses which begin the second year. This plan provides: (1) an opportunity to explore the field before undertaking engineering courses, (2) skills and techniques for early employment as a technician, (3) a descriptive background for engineering courses, and (4) strong motivation for the study of mathematics, physics, and engineering courses.

The laboratory work is organized to parallel closely the type of work the young engineer is usually assigned during his first few years of employment after graduation. The student starts in the freshman year with very closely supervised jobs, proceeds from directed experiments in analysis to student planned investigation, and advances to some senior year projects which involve engineering synthesis.

It is recommended that the high school student planning a career in electronic engineering take a balanced program including mathematics, physical science, drawing, and shops. The junior college student planning to transfer into this department would do well to meet, insofar as possible, the requirements of this curriculum.

The department occupies new facilities consisting of laboratories, shops, and auxiliary rooms. The laboratories are equipped with the latest instruments and test equipment available for the study and investigation of most phases of electronics. The facilities and equipment, coupled with "learn by doing" techniques, provide an opportunity for the student to gain a knowledge of industrial practices as well as an excellent theoretical background.

The department sponsors a student branch of the Institute of Electrical and Electronic Engineers and an amateur radio group.
### CURRICULUM IN ELECTRONIC ENGINEERING

#### Freshman

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<th>Course</th>
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<td>Fundamentals of Electronic Technology (EL 101, 102, 103)</td>
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<td>Electronic Technology Laboratory (EL 141, 142, 143)</td>
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<td>Sheet Metal Processes (MP 155)</td>
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<td>Welding (WE 144, 145)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>Electron Devices Laboratory (EL 248, 249)</td>
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<td>Fundamentals of Electrical Engineering (EE 211, 212, 213)</td>
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<td>Electronic Measurements (EL 224, 225, 226)</td>
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<td>Drafting for Electronics (EL 146)</td>
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<td>Engineering Statics (ME 211)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>Physics of Electricity and Magnetism (Phys 204)</td>
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<td>Engineering Drafting (ME 121, 122)</td>
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<td>Passive Network Laboratory (EL 341, 342)</td>
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<td>Transmission Lines (EL 303)</td>
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<td>Active Networks (EL 304)</td>
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<td>Active Networks Laboratory (EL 344)</td>
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<td>Oscillators and Wave Shaping (EL 305)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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**DESCRIPTIONS OF COURSES IN ELECTRONIC ENGINEERING**

**EL 101 Fundamentals of Electronic Technology (3)**

Fundamentals of DC circuits and networks, inductance, capacitance, magnetism, and meters. Problem solving and applications of basic electronic concepts which provide a fundamental background for the beginning student. 3 lectures.

**EL 102 Fundamentals of Electronic Technology (3)**

Fundamentals of AC circuits, reactance, impedance, resonance, and transformers. Introduction to vacuum tubes, gas tubes and the cathode ray tube, semiconductor fundamentals. Problem solving and application of basic electronics. 3 lectures. Prerequisite: EL 101. Prerequisite or concurrent: Math 117

**EL 103 Fundamentals of Electronic Technology (3)**

Basic electronic concepts for the beginning student. Introduction to power supplies, amplifiers, and oscillators. Basic transmitters and receivers. Introduction to transmission lines, antennas and electronic test equipment. 3 lectures. Prerequisite: EL 102. Prerequisite or concurrent: Math 118

**EL 141, 142, 143 Electronic Technology Laboratory (2) (2) (2)**

Directed assignments facilitating an understanding of the operation and construction of electrical instruments, electronic equipment, basic electron devices, and basic circuits. Emphasis on use of test equipment reporting of engineering experiments and projects. 2 laboratories.

**EL 146 Drafting for Electronics (2)**

Schematic drafting. Electronic and industrial symbols. Symmetry and balance. Schematic delineation, projection. Graphic integration. 1 lecture, 1 laboratory. Prerequisite: ME 122

**EL 208, 209 Electronic Devices (3) (3)**

The internal behavior of vacuum, gaseous and semiconductor devices. Mathematical and graphical analysis, equivalent circuits. 3 lectures. Prerequisite: Math 201, Chem 321, Physics 132. Concurrent: EL 248, 249

**EL 222, 223 Electronic Engineering (3) (3)**

Theory, operation and application of electronic instruments and controls, adjustment and maintenance of electronic devices. 2 lectures, 1 laboratory. Prerequisite: Math 201, EE 231. For nonelectronic engineering majors.

**EL 224, 225, 226 Electronic Measurements (2) (2) (2)**

Applied measurement techniques applicable to the following general topics for each of the three quarters respectively: I. Electronic Control Measurements and Calibration. II. Pulse Measurements. III. Radio Frequency Measurements. 1 lecture, 1 laboratory. Prerequisite: EL 103, 143, Math 201

*To be selected with the approval of the adviser.
†To be selected from the General Education List. Include one course in literature.
EL 240  Additional Engineering Laboratory  (1-2)
  Total credit limited to 4 units, with not more than 2 units in any one quarter.

EL 248, 249  Electron Devices Laboratory  (1) (1)
  Fundamental experiments concerned with the more common types of vacuum,
gaseous and semiconductor devices. 1 laboratory. Concurrent: EL 208, 209

EL 301  Passive Network Analysis  (3)
  Formulation and solution of network equations by classical and Laplace transform
methods. Topics in the time and the frequency domain. 3 lectures. Prerequisite: 
EE 213 or consent of the instructor. Prerequisite or concurrent: Math 317, EL 341

EL 302  Passive Network Analysis  (3)
  Complex frequency, transform immittances, poles and zeros, sinusoidal steady-
state analysis, one-port reactive networks, filters. 3 lectures. Prerequisite: EL 301, 
341. Concurrent: EL 342

EL 303  Transmission Lines  (3)
  Fundamental concepts of reflections, velocity of propagation, characteristic im-
pedance. General equations and their solution. Graphical aids, matching lines with 
loss. 3 lectures. Prerequisite: EL 301, 302, 341, 342. Concurrent: EL 343

EL 304  Active Networks  (3)
  Semiconductors and vacuum tubes as circuit elements. Audio frequency ampli-
fiers. Feedback amplifiers and stabilization. 3 lectures. Prerequisite: EL 209. Con-
current: EL 344

EL 305  Oscillators and Wave Shaping  (3)
  Oscillators and frequency stability. Wave shaping and pulse techniques. 3 lectures. 
Prerequisite: EL 304. Concurrent: EL 345

EL 306  Modulation and Detection  (3)
  Single and double tuned RF amplifiers. Formulation and analysis of modulation 
process. Amplitude, phase, and frequency modulation techniques. Detection and 
frequency conversion. 2 lectures. Prerequisite: EL 304. Concurrent: EL 346

EL 307  Servomechanisms  (3)
  Principles of closed loop control systems. Analysis of transfer functions. Correcti-
tive networks. Stability criteria. 3 lectures. Prerequisite: EL 302, 305, EE 313. 
Concurrent: EL 347

EL 341, 342  Passive Networks Laboratory  (1) (1)
  Experimental consideration of the characteristics and behavior of selected net-
works. Extensive instrumentation. 1 laboratory. Prerequisite: EL 226, EE 213, EE 
253. Concurrent: EL 301, 302

EL 343  Transmission Lines Laboratory  (1)
  Transmission line measurements. Impedance, stub matching, transmission line 
charts, measurements of unknown loads. 1 laboratory. Prerequisite: EL 341, 342. 
Concurrent: EL 303

EL 344  Active Networks Laboratory  (1)
  Experimental determination of the important operating characteristics of power 
supplies and audio voltage and power amplifiers. Performance testing of audio 
amplifiers in accordance with standard IRE-EIA procedures. 1 laboratory. Con-
current: EL 304

EL 345  Oscillators and Wave Shaping Laboratory  (1)
  Experimental determination of the important operating characteristics of tuned 
radio frequency voltage and power amplifiers and radio frequency oscillators. Per-
formance testing of radio receivers in accordance with standard IRE-EIA proce-
dures. 1 laboratory. Concurrent: EL 305
Engineering Division

EL 346 Modulating and Detection Laboratory (1)
Experimental determination of the important operating characteristics of modulators, detectors, discriminators, and frequency converter circuits. Standard performance testing. 1 laboratory. Concurrent: EL 306.

EL 347 Servomechanisms Laboratory (1)
Selected laboratory exercises from EL 307. 1 laboratory. Prerequisite: EL 342. Concurrent: EL 307

EL 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories. Prerequisite: Senior standing.

EL 402 Electromagnetic Fields (3)
Static and quasi-static fields; laws of Coulomb, Gauss, Ohm, Faraday, Ampere; equations of electrostatic and magnetic fields, boundary value problems; introduction to time varying fields. Vector analysis used throughout. 3 lectures. Prerequisite: EE 213, Math 317

** EL 421, 422, 423 ** Electrical Metrology (4) (4) (2)
Precision electrical and electronic measurements as utilized in standards laboratories. The physical basis of electrical standards, secondary and primary standards of time, voltage, current, resistance, inductance and capacitance. Measurement techniques. Statistical measurement analysis. Maintenance of laboratory standards. Industrial calibration and standardization practices. 3 lectures, 1 laboratory. Prerequisite: Senior standing.

** EL 424, 425, 426 ** Computer Design and Application (4) (4) (2)
Deals with the following general topics for each of the three quarters respectively: I. Pulse Techniques. The generation and modification of pulse waveforms. II. Digital computer design analysis and applications. III. Analog computer design analysis and application. 3 lectures, 1 laboratory. Prerequisite: Senior standing, EL 303, 306

** EL 427 †, 428, 429 Microwave Theory and Technique (2) (4) (4)
Microwave concepts, signal generation, applications to navigation, communication, scientific analysis and microwave energy propagation. 3 lectures, 1 laboratory. Prerequisite: Senior standing, EL 303, 343

** EL 431, 432, 433 † Communication (4) (4) (2)
Technical aspects of commercial and domestic radio communication. Analysis of telemetry problems related to missile guidance and data handling. Information theory as applied to contemporary communication techniques. Antennae, wave propagation, and radiation. 3 lectures, 1 laboratory. Prerequisite: Senior standing, EL 303, 306

EL 451, 452, 453 Industrial Electronics (1) (1) (1)
Selected engineering activity with industry. Design, test, evaluation, and analysis responsibilities of the junior engineer. Prerequisite: Senior standing.

EL 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Project results are presented in a formal report. Minimum 120 hours total time.

EL 463 Undergraduate Seminar (2)
Discussion of new developments in the fields of communications and industrial electronics, with particular reference to field of employment. Job analysis. 2 lectures.

** To be offered when course enrollment justifies.
† These courses consist of 1 lecture, 1 laboratory.
DESCRIPTIONS OF COURSES IN ELECTRICAL ENGINEERING

EE 211, 212, 213  Fundamentals of Electrical Engineering  (3) (3) (3)

Electrical circuits and parameters. Introduction to network theorems. Energy sources, magnetic circuits and amplifiers, transformers, alternating current circuits and parameters, complex algebra, single phase circuits, symbolic treatment, poly-phase circuits, symmetrical components. Analysis of non-sinusoidal waves by Fourier series. 3 lectures. Prerequisite: Math 201, Phys 132. Prerequisite or concurrent: Phys 204

EE 231, 232, 233  Principles and Practices of Electrical Engineering  (3) (3) (3)

Electrical principles. Electric and magnetic circuits. Electrical machines. Machine controls and applications. Industrial wiring systems. Control and measurements including electronic devices. For nonelectronic engineering majors. 2 lectures, 1 laboratory. Prerequisite: Math 201

EE 252, 253  Electrical Engineering Laboratory  (1) (1)

Selected laboratory exercises in electrical engineering. 1 laboratory. Prerequisite or concurrent: EE 212, 213

EE 313  Electric Machines  (3)

Physical and electrical characteristics of the more common types of DC and AC machinery. Provides background facilitating selection of appropriate machine for a specific job. 2 lectures, 1 laboratory. Prerequisite: EE 213, 253

INDUSTRIAL ENGINEERING DEPARTMENT

Robert A. Quaney  J. Garrard Wright

Department Head, Joseph P. Wymer

The industrial engineering program prepares graduates for a variety of assignments in industry such as manufacturing engineering, production planning and control, plant layout and materials handling, methods and standards, quality control, operations research, systems and procedures, engineering liaison and other duties concerned with improving efficiency and quality.

Emphasis is placed on planning the use of tools and equipment rather than designing the equipment; on the production rate and quality of the product rather than on designing the product itself. Parallel emphasis is placed on the managerial and financial aspects of planning, production, and sales.

A major distinction between industrial engineering and other branches of engineering is that the industrial engineer must consider not only the behavior of things such as tools and equipment, but must also include in his plan the behavior of people as they operate together in organizations, whether these organizations are simple or complex.

Excellent production facilities are available to make the instruction realistic and characteristic of the requirements of industry. Many local industries have permitted industrial engineering students to work on student projects in their plants.
# CURRICULUM IN INDUSTRIAL ENGINEERING

## Freshman

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<td>Motion and Time Study (IE 122, 123)</td>
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<td>Molding and Casting (IE 134)</td>
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## Sophomore

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<td>Production Processes (IE 222, 223)</td>
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<td>Industrial Costs &amp; Controls (IE 232, 233)</td>
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## Junior

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<td>Plant Layout &amp; Materials Handling (IE 331, 332)</td>
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<td>Industrial Data Processing (IE 428)</td>
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Senior

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To be selected with written permission of IE Department.

To be selected from the General Education list.

17 17 17

DESCRIPTIONS OF COURSES IN INDUSTRIAL ENGINEERING

IE 111 Industrial Engineering (3)

Introduction to the field of industrial engineering. Relationship of the industrial engineer to various divisions of business organizations, including manufacturing, sales and services. 3 lectures.

IE 122, 123 Motion and Time Study (3) (3)

Theory and application of methods analysis as related to production design, work place layout, tools and equipment, and services. Micromotion studies, flow process charts and diagrams, man-machine charting, etc. Principles and techniques used in establishing standard times, time study, standard data, formula application, predetermined motion times, work sampling, etc. 2 lectures, 1 laboratory.

IE 134 Molding and Casting (2)

Shaping of metals while in the liquid state; commonly used molding and casting techniques for both ferrous and non-ferrous materials and alloys. 1 lecture, 1 laboratory.

IE 202 Production Processes (3)

Manufacturing processes such as foundry, forging, plastics, chemical milling, powder metallurgy, sponge and solid rubber; raw material processing such as steel, aluminum, glass, cloth and chemicals; finishing processes such as degreasing, painting, plating, and other surface treatments. For majors other than IE. 3 lectures. Prerequisite: NIP 143, WE 145

IE 214 Industrial Incentives (3)

Types of incentives used in industry. Individual and group incentive plans, bonus plans, and suggestion systems. 3 lectures. Prerequisite: IE 122, IE 123

IE 222 Production Processes (3)

Manufacturing processes. Forging, drawing, extruding, mixing, milling, calendaring, etc. Ferrous and non-ferrous metals, plastics and rubber processes. New manufacturing techniques such as high energy forming, chemical milling, electrical machining, and numerical control. 2 lectures, 1 laboratory. Prerequisite MP 143, WE 145, IE 134

IE 223 Electronics Production Processes (3)

Manufacturing processes as used in the electronics industry from fabrication of sample chassis to manufacturing of complex printed circuits and master consoles. 2 lectures, 1 laboratory. Prerequisite: IE 222

* To be selected with written permission of IE Department.
† To be selected from the General Education list.
IE 232, 233  Industrial Costs and Controls  (3) (3)
Engineering approach to cost recording, budgetary procedures and controls. Estimating production costs. Engineering problems used to teach fundamentals. Current techniques in mechanizing the cost recording and cost control functions. 2 lectures, 1 laboratory. Prerequisite: IE 111

IE 236  Production Planning and Control  (4)
Principles of planning and controlling manufacturing activities. Product development, forecasting, scheduling and loading, process planning and routing, materials planning and control, dispatching, progress reporting, and corrective action. Quantitative methods. Design of planning and control systems. Case studies of actual systems. 3 lectures, 1 laboratory. Prerequisite: IE 111

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 324  Production Engineering I  (3)
Principles of designing and developing detailed production plans for given products. Selection of production processes, sequence of operations, equipment, facilities, methods, tool plans and requirements. Estimating costs. Value engineering and cost analysis techniques. Short-run as well as long-run production techniques. 2 lectures, 1 laboratory. Prerequisite: IE 222, 236, MP 146, WE 146

IE 325  Production Engineering II  (3)
Manufacturing techniques. Jigs, fixtures, dies and special purpose tooling. Manufacturing economy and reliability. Automating the manufacturing process. Tooling required for integrated methods, transfer mechanisms, production accessories, electromechanical tooling devices. 2 lectures, 1 laboratory. Prerequisite: IE 324, ME 123

IE 331, 332  Plant Layout and Material Handling  (3) (3)
Product development, production analysis, selection and utilization of plant equipment, material flow principles, material handling, plant layout. 2 lectures, 1 laboratory. Prerequisite: IE 223

IE 343  Production Engineering III  (2)
Estimation, scheduling, and manufacture of selected items on a simulated industrial production line, utilizing the tooling designed and manufactured in IE 325. 2 laboratories. Prerequisite: IE 325

IE 344  Industrial Processes Laboratory  (2)
Operation and use of modern machine tools, plastics and metal-forming machinery. Operation by the student of representative types of equipment. 2 laboratories. Prerequisite: IE 223, MP 146

IE 400  Special Problems for Advanced Undergraduates  (1-2)
Arrangements to be made with department head. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

IE 404  Industrial Organization  (3)
Principles of industrial organization and control. Organizational relationships, departmentalization, centralization, decentralization, etc. Case histories utilized to illustrate the principle and theory. 3 lectures. Prerequisite: Senior standing.

IE 405  Engineering Economy  (3)
Techniques for comparing the relative economies of engineering and manufacturing investments. Use of the scientific method and compound interest and depreciation formulas to compare alternatives before and after federal income taxes. Increment and sunk costs; retirement and replacement studies; sensitivity analysis; concepts of cash flow and capital rationing; consideration of intangibles. 3 lectures. Prerequisite: Junior standing in IE courses.
IE 406 Systems and Procedures (3)
Techniques of analysis and design applied to systems and procedures. Development of overall systems. Writing required procedures to implement efficient execution of assigned functions. 2 lectures, 1 laboratory. Prerequisite: Senior standing.

IE 415 Quality Control (3)
Systems of inspection, analysis and action taken to control manufacturing processes. Sampling plans, control charts, statistical analysis, and other tools used by management to control costs and improve quality. 3 lectures. Prerequisite: IE 324, Math 309

IE 416 Introduction to Operations Research (3)
Application of statistical methods, linear programming, queuing and other analysis techniques to problems encountered in industry. 3 lectures. Prerequisite: Senior standing.

IE 428 Industrial Data Processing (3)
Production applications of various computers and combinations of supporting data processing equipment. Engineering studies of systems, methods and equipment applications. Problems in inventory control, production control, payroll, etc., requiring data processing equipment. 2 lectures, 1 laboratory. Prerequisite: Junior standing.

IE 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

IE 463 Undergraduate Seminar (2)
Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments. 2 lectures. Prerequisite: Senior standing.
Mechanical engineering deals with equipment, machines and products which are characterized by their utilization of the strength and rigidity of structural materials, the useful properties of fluids, the conversion of energy from fuels to useful work, and the interrelation of wheels, gears, and levers.

Graduates obtain employment with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include plant engineering, tool, machine, and pipe design, engineering testing, sales engineering, air conditioning, refrigeration, construction supervision, and maintenance planning.

It is recommended that the high school student planning a career in mechanical engineering take a balanced high school program including mathematics, physical sciences, mechanical drawing, and shops. The junior college student planning to transfer into this department would do well to meet, insofar as possible, the requirements of the curriculum in mechanical engineering.

During the junior year, students will have an opportunity to choose several areas of specialization within the field of mechanical engineering. Included among these are advanced machine design, tool design, heat power, nuclear physics and nuclear engineering, and advanced mechanics. An elective sequence in electronic engineering is also available.

The department occupies three laboratories where the principles developed in the classroom can be applied to the operation and testing of heat transfer equipment, fluid-handling apparatus, heat power equipment, internal combustion engines, and engineering materials. The dynamics of machines are studied in a separate facility.

**CURRICULUM IN MECHANICAL ENGINEERING**

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<td>Mechanical Engineering (ME 131, 132, 133)</td>
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California State Polytechnic College

### Sophomore

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<td>Engineering Kinematics and Dynamics (ME 215)</td>
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<td>Engineering Dynamics (ME 216)</td>
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<td>Descriptive Geometry (ME 125)</td>
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| Total                                                                 | 16½| 18½| 17½|

### Junior

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<td>Fluid Mechanics (ME 311, 312)</td>
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<td>Machine Design (ME 324, 325)</td>
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<td>Heat Transfer (ME 313)</td>
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| Total                                                                 | 18 | 18 | 18 |

### Senior

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<td>Advanced Engineering Measurement (ME 435)</td>
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<td>Technical Selection in Mechanical Engineering</td>
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| Total                                                                 | 17 | 16 | 17 |

* To be selected with the approval of the student's adviser.
† To be selected from the General Education List.
DESCRIPTIONS OF COURSES IN MECHANICAL ENGINEERING

ME 121 Engineering Drafting (2)

ME 122 Engineering Drafting (2)
Auxiliary views and section views. Dimensioning auxiliary views and section views. Relationship between engineering drawings and shop processes. Intersections of surfaces. Development of surfaces. 1 lecture, 1 laboratory. Prerequisite: ME 121

ME 123 Engineering Drafting (2)
Detail working drawings of typical machine parts. Precision dimensions, limits and tolerances. Screw threads, shop notes, assembly drawings, parts lists. Threaded fasteners, rivets, keys and springs. Welding drawings. Piping drawings. Elements of structural and architectural drawing. 1 lecture, 1 laboratory. Prerequisite: ME 122

ME 125 Descriptive Geometry (2)
Solution of typical drafting room problems by graphical methods of multiview projection. Construction of fundamental views. Perpendicular, parallel and skew lines. Relationships of points, lines, and planes. Intersections of planes. Dihedral angles. 2 laboratories. Prerequisite: ME 121

ME 131 Mechanical Engineering (3)
Problem solving in mechanical engineering. Problems dealing with the basic concepts of dimension, time, temperature, pressure, motion and energy. Fundamentals of engineering experimentation and data presentation. 2 lectures, 1 laboratory.

ME 132 Mechanical Engineering (2)
Problems involving basic computational methods including slide rule and elementary concepts of digital computer programming. 1 lecture, 1 laboratory.

ME 133 Mechanical Engineering (2)
Introduction to machine design techniques and power transmission element design or selection. Couplings; U-joints; roller and silent chains; V, flat, and gear belts; gears and gear transmissions; cams; friction drives. 1 lecture, 1 laboratory.

ME 144 Mechanical Engineering Laboratory (1)
Basic mechanical engineering measurements. Experimental determination of speed, time, pressure, temperature, density, viscosity, and related properties, using instruments found in general use in industry. Preparation of formal engineering reports. 1 laboratory. Concurrent: ME 131

ME 211 Engineering Statics (3)
Vector approach applied to two and three dimensional force systems. Application of free-body diagrams to the solution of two and three dimensional equilibrium, frames and machines; dry friction and belt friction. 3 lectures. Prerequisite: Phys 131, Math 201. For majors in EL, CE, IE, Aero, Math and Physical Sciences.

ME 212 Engineering Dynamics (3)
Kinematics covering basic motion problems, absolute and relative linear velocity and acceleration, relative angular velocity and acceleration, Newton's laws of motion; force, mass and acceleration; work and energy; linear impulse and momentum. 3 lectures. Prerequisite: Math 202, ME 211. For majors in EL, CE, IE, Aero, Math and Physical Sciences.
ME 214  Engineering Statics  (3)
Two and three dimensional force systems; two and three dimensional equilibrium employing free-body diagrams; structures including two and three dimensional trusses and frames; load, shear, and moment diagrams for beams with concentrated loads; friction; and virtual work. 3 lectures. Prerequisite: Phys 131, Math 201, ME 123

ME 215  Engineering Kinematics and Dynamics  (3)
Distributed forces, centroids and load, shear and moment diagrams of beams with distributed loads; moment of inertia and radius of gyration; kinematics covering basic motion, centroids, relative linear velocity and acceleration, relative angular velocity and acceleration with applications to planetary gearing. 3 lectures. Prerequisite: ME 214, Math 202

ME 216  Engineering Dynamics  (3)
Newton's laws of motion; force, mass, and acceleration; work and energy, conservation of energy; linear and angular impulse and momentum, conservation of momentum, impact and gyroscopic motion; introduction to theory of mechanical vibration. 3 lectures. Prerequisite: ME 215, Math 203. Concurrent Math 316

ME 218  Strength of Materials  (3)
Properties of materials, stress-strain diagrams, mechanical hysteresis and creep; design loads, working stresses and factor of safety; deflections and stresses in structural and machine members. Use of Mohr's Circle for principal stresses; stress concentration. Combined axial and torsional loads with application to helical springs; load, shear, and moment diagrams for beams; riveted and welded joints. 3 lectures. Prerequisite: ME 214 or ME 211 and Math 201

ME 219  Strength of Materials  (3)
Deflection and stress in structural and machine members under combined axial, torsional, and flexural loading; deflection and slope of beams by various methods; deflection, slope, load, shear and moment curve transposition by multiple integration and differentiation; statically indeterminate members; columns, concentric and eccentric loading. 3 lectures. Prerequisite: ME 214 or ME 211 and Math 201

ME 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

ME 245  Mechanical Engineering Laboratory  (1)
Application of basic measurement techniques to actual equipment and the interpretation of results. Includes experiments in mechanics, instrumentation, turbo-machinery, and elementary performance testing of mechanical equipment. Experimental results compared with analytical determinations. Preparation of formal engineering reports. 1 laboratory. Prerequisite: ME 144

ME 249  Materials Test Laboratory  (1)
Commercial tests of materials. Familiarity with the physical properties of industrial materials. 1 laboratory. Prerequisite: ME 144 or CE 122. Concurrent: ME 218

ME 301  Thermodynamics  (3)
The general energy equation, equations of state, First Law of Thermodynamics. Applications are considered and analyzed through the assignment of problems and exercises. 3 lectures. Prerequisite: Phys 132, Math 203

ME 302  Thermodynamics  (3)
Entropy and the Second Law, various thermodynamic cycles, and the relationships that obtain in the study of imperfect gases. Fundamentals of heat transfer applications are considered and analyzed through the assignment of problems and exercises. 3 lectures. Prerequisite: ME 301
ME 311 Fluid Mechanics (3)
Analysis and problems dealing with the various basic properties of fluids. These include: fluid statics, Bernoulli's Equation, the general energy equation of flow, impulse and momentum, and the flow of real fluids in closed conduits. 3 lectures. Prerequisite: ME 216, Math 203

ME 312 Fluid Mechanics (3)
Analysis and problems dealing with fluid measurement. Incompressible and compressible flow in orifices, nozzles, Venturi meters. Compressible flow in conduits and about immersed objects. Dynamic similitude, dimensional analysis and fluid machines. 3 lectures. Prerequisite: ME 311

ME 313 Heat Transfer (3)
Basic principles of heat transfer and their application to the design of industrial equipment. Steady state and transient problems of conduction by analytical and numerical methods. Free and forced convection. Transfer of radiant energy. 3 lectures. Prerequisite: ME 301, 311, Math 316

ME 314 Engineering Materials (3)
Structure, composition and physical properties of commercially useful materials. Selection of materials for specific applications. Heat treatment. Corrosion of metals and alloys; protective coatings. 3 lectures. Prerequisite: Phys 131

ME 315 Mechanical Vibrations (3)
Damped and forced vibrations, transient and steady state motions, vibration isolation, commercial vibration control and measuring hardware and electrical analogs of vibratory systems; balance and critical speeds of rotating machine members, flywheel and multicylinder engine balancing. Actual case studies of vibration isolation and machine balancing. 3 lectures. Prerequisite: ME 216, Math 316

ME 324 Machine Design (3)
Design of basic machine elements such as shafts, couplings, clutches, brakes, belts, and pulleys, chains and sprockets, gears, and cams. Design of machine elements based on endurance strength, stress concentration, combined stresses, variable loads, and industrial design techniques. 3 lectures. Prerequisite: ME 203, 214, MP 148

ME 326 Machine Design (3)
Design of machine frames and castings. Tolerances and surface roughness for machine elements and assemblies. Design of complete machines. Checking designs and redesigning machine failures. 1 lecture, 2 laboratories. Prerequisite: ME 324, IE 202

ME 334 Metallurgy (3)

ME 346 Mechanical Engineering Laboratory (1)
Experiments in the application of thermodynamics and fluid mechanics theory to various types of equipment. Determinations of the efficiency of equipment using various heat cycles, modes of heat transfer and operation. Determination of calorific value of various fuels and the study of fluid flow phenomena. Preparation of formal engineering reports. 1 laboratory. Prerequisite: ME 144, 301, 311
ME 400  Special Problems for Advanced Undergraduates  (1-2)
  Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

* ME 408, 409  Nuclear Engineering  (3) (3)
  Engineering considerations in design, control, and operation of nuclear reactors; materials of construction; thermal, hydraulic and mechanical problems; instrumentation and control; isotope preparation; radiation hazards, shielding and disposal of radioactive waste; power from nuclear fuels. 3 lectures. Prerequisite: ME 313, 334, Math 316, Phys 211

ME 411  Heat Power  (3)
  Application of thermodynamics to actual power cycles. Turbine theory. Modern combustion gas and vapor power plants and auxiliaries. Economics of power generation. 3 lectures. Prerequisite: ME 302

ME 412  Heat Power  (3)
  Theory and application of fuels, fuel systems, aspiration, combustion, detonation; mechanism, lubrication and performance of internal combustion engines. 3 lectures. Prerequisite: ME 302, 313

ME 414  Advanced Dynamics  (3)
  Applications of Lagrange's equations and Hamilton's principle to systems having many degrees of freedom, gyro dynamics, trajectory studies of rigid and elastic bodies. 3 lectures. Prerequisite: ME 315, Math 318

ME 415  Advanced Dynamics  (3)
  Analysis of transient response, beam vibration by Rayleigh's Method, method of influence, coefficients, iteration procedure, fundamentals of servo-mechanisms including theory of dynamic stability. 3 lectures. Prerequisite: ME 414, Math 317

ME 417  Environmental Engineering  (3)
  Environmental requirements for human habitation, psychrometrics, building heating and cooling loads, air temperature and humidity control. 3 lectures. Prerequisite: ME 302, 313

ME 418  Environmental Engineering  (3)
  Air cleaning and distribution, radiant heating and cooling, design of the complete air conditioning system. 2 lectures, 1 laboratory. Prerequisite: ME 417

* ME 420  Creativity  (2)
  A survey of creativity. Learning the skill and technique of creative thought. Demonstration of creative solutions to problems. 2 lectures. Prerequisite: Junior standing.

* ME 421  Mechanisms  (2)
  Application of special mechanisms to practical problems in engineering. Geneva wheels, ratchets, couplings, universal joints, governors, escapements, straight line motion mechanisms. 1 lecture, 1 laboratory. Prerequisite: ME 216

ME 431, 432  Tool Design  (3) (3)
  Design of manufacturing tools such as jigs, fixtures, and dies. Materials, tolerance balancing, and toolroom methods as design factors. 2 lectures, 1 laboratory. Prerequisite: ME 326

ME 435  Advanced Engineering Measurements  (2)
  Application of sensing, modifying and signal read-out devices to problems of engineering measurement and control. System response and errors are studied for typical installations. 1 lecture, 1 laboratory. Prerequisite: ME 302, 312, 315, EL 222

* To be offered when course enrollment justifies.
Creativity and human engineering in machine design. Power source selection. Design of electrical, pneumatic, and hydraulic control systems for machines. Design of compression, extension, torsion, flat, wire form, and power springs. 2 lectures, 1 laboratory. Prerequisite: ME 326

Design and use of power screws, flexible shafts, flywheels, and high-speed machinery. Heat treatment required for machine functions. Dimensional control. Standard machine components, vari-speed drives or reducers, and feed mechanisms. Recent design developments. 2 lectures, 1 laboratory. Prerequisite: ME 315, 438

Selection and completion of a project under a minimum of 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 326 and all required MP courses.

General discussion of new developments, policies, practices, and procedures in regular seminar. Each individual is responsible for the preparation and presentation of an engineering development in his chosen field. 2 lecture-problem sessions. Prerequisite: Senior standing.

* To be offered when course enrollment justifies.
Instruction in engineering shop practice has two objectives: (1) to give the student a foundation in the basic skills and (2) to give an understanding of the part machine tools play in present-day engineering and manufacturing enterprises.

The purpose of these laboratories is to help the engineering student in gaining an understanding of tools and materials, as well as the capabilities and limitations of certain machine tools.

The department occupies five laboratories which are equipped with the latest machine tools. These laboratories are also equipped with the tools, attachments, and precision instruments for the construction of dies, tools, jigs, and fixtures such as are found in modern industry. Punch presses, die-sinking machines, plastic presses and plastic mold-making equipment are provided for engineering students taking advanced courses.

**DESCRIPTIONS OF COURSES IN METAL PROCESSES**

**MP 141 Manufacturing Metrology (1)**
Actual experience in linear metrology. Basic principles of measuring size, flatness, roundness, angles and threads. Dimensional control concepts and methods of non-precision and precision measurement. 1 laboratory.

**MP 142 Metal Processes (1)**
Fundamentals of lathe operation, including straight and taper turning between centers, chuck work, and thread cutting. Also feeds, speeds, and tool grinding. 1 laboratory.

**MP 143 Metal Processes (1)**
Fundamentals of lathe operation including taper turning, taper boring, thread cutting, other chucking operations, and machinability of metals. 1 laboratory. Prerequisite: MP 142

**MP 144 Metal Processes (1)**
Fundamentals of milling machine and shaper operation including precision setup and plain surfacing operations. 1 laboratory. Prerequisite: MP 142

**MP 146 Metal Processes (1)**
Advanced milling machine and shaper practice including contoured and angular surfacing operations, boring, serrations, rack and spur gear cutting. 1 laboratory. Prerequisite: MP 144

**MP 148 Manufacturing Processes Laboratory (1)**
Advanced milling machine, shaper, and lathe practice, including accessories and attachments. Also instruction in cylindrical, surface, tool and cutter grinding and honing. Injection, transfer, compression and vacuum molding of plastics. 1 laboratory. Prerequisite: MP 143, 146

**MP 155 Sheet Metal Processes (1)**
Basic sheet metal processes including the techniques of hand and machine operation used in layout, cutting, forming, assembling and finishing. 1 laboratory.

**MP 156 Light Metal Production Processes (1)**
Application of sheet metal processes related to design and production of durable goods with emphasis upon dies, jigs, and fixtures used in stamping and press work. 1 laboratory. Prerequisite: MP 155

**MP 240 Machine Tools (1-2)**
Advanced individual instruction on all machine tools. Construction and repair of laboratory equipment. Total credit limited to 4 units. 1 or 2 laboratories. Prerequisite: MP 144
It is the aim of this department to give students in the engineering and agriculture divisions of the college an opportunity to gain both theoretical and practical knowledge of techniques and applications of the principal welding processes.

Facilities provided include general oxyacetylene welding equipment, automatic and manual flame cutting apparatus, general arc welding equipment, including both AC and DC types, automatic and manual inert-gas shielded arc welding equipment, seam and spot welding machines, and automatic submerged-melt arc welding equipment.

**DESCRIPTIONS OF COURSES IN WELDING**

**WE 144** Welding Survey (1)
General survey of all major welding processes, weld nomenclature, types of joints, welding symbols, weld inspection, and thermal effects of welding. Basic oxyacetylene welding techniques and safety. 1 laboratory.

**WE 145** Production Welding Processes I (1)
Studies of the tungsten-inert-gas welding process, the resistance welding processes, brazing and braze welding. 1 laboratory. Prerequisite: WE 144

**WE 146** Production Welding Processes II (1)
Fundamentals of metallic arc welding including equipment, electrodes and basic procedures. Oxygen cutting. High speed consumable electrode processes. 1 laboratory. Prerequisite: WE 144

**WE 156** Advanced Metallic Arc Welding (1)
Shielded metallic arc welding of heavy steel plates. Includes butt weld types, uses of backing materials, hard facing, cast iron, and overhead fillets. Basic weld tests. Arc welding of light-gauge steel sheets. 1 laboratory. Prerequisite: WE 146

**WE 240** Additional Welding Laboratory (1-2)
Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories. Application of credit as elective in major department requires approval of major department head. Prerequisite: WE 145 or 146, Permission of Department.

**WE 254** Advanced Welding (1)
Types and uses of various welding machines, operating costs. Use of structural steel shapes for building machinery and farm equipment. Welding symbols, strength of welded joints, and basic cost estimating problems. 1 laboratory. Prerequisite: WE 156

**WE 322** Non-Destructive Testing (4)
Studies of non-destructive testing methods. Practice in x-ray and penetrant inspection. 2 lectures, 2 laboratories. Prerequisite: ME 334

**WE 341** Special Problems in Welding (1-3)
Fundamentals of welding metallurgy, weldability of steels, steels and alloys for welded construction. Codes for construction of welded unfired pressure vessels. Design of pressure vessels according to the code used. 1, 2 or 3 laboratories. Prerequisite: WE 156
WE 421, 422 Weld Design (3) (2)

Welding processes, applications and limitations. Design of welded joints related to the welding processes, performance of welded joints under various load conditions with various metals and filler metals. Welding costs and tooling methods. WE 421: 3 lectures. WE 422: 2 laboratories. Prerequisite: WE 146, MP 144, ME 324, or Aero 349 or CE 341. ME 334 recommended.

WE 443 Mechanical Metallurgy (1)

A seminar course on the classification, designation, and properties of metals and alloys. Emphasis on trade nomenclature. 1 laboratory. Prerequisite: Senior standing.
ARTS AND SCIENCES DIVISION
Data Processing Machine Explained to Business Management Students

Journalism Students Work at Copy Desk

Accountancy Laboratory in Action
ARTS AND SCIENCES DIVISION

The Arts and Sciences Division has three functions in the educational plan of the California State Polytechnic College. Primarily, it is a service division providing all students of the college with instruction in basic and supporting work common to all curricula. Most of the general education is provided by the Arts and Sciences Division with particular emphasis upon preparing the college's graduates for their roles as active, participating citizens of community, state, and nation. A second function of the division is to offer a broad and varied program of teacher education. Teaching credential programs are available in biological sciences, language arts, mathematics, physical education, physical sciences, and social sciences. These programs offer opportunities in elementary and secondary school teaching. The third function of the division is to provide educational opportunities in its major programs for those who do not choose teaching as an occupation. Each divisional curriculum is designed to prepare its graduates for specific jobs in its area in keeping with the college's philosophy of occupational education. The Department of Music and Art provides supporting courses which contribute to the cultural and social development of students in all divisions of the college.

BUSINESS CURRICULA

Curricula in business are offered leading to the bachelor of science degree in Accountancy, Business Management, and Marketing. Each of these majors is planned to provide degree-level education leading to specific occupations in many aspects of business and commerce.

The business building has classrooms and laboratories well equipped with many types of business machines used in modern industry. The location of the Kellogg Campus in the midst of the highly industrialized Los Angeles area affords unique opportunities for visits to industrial and commercial firms and correlation of classroom work with on-the-job observations of business activities.

Programs are listed on the following pages in alphabetical order by department.

ACCOUNTANCY DEPARTMENT

Department Head, George E. Carlberg

John F. Hardy
James B. Maury, Jr.

Frank Paul
Jewel M. Riddle

The Accountancy Department has several functions: 1) to provide preparation for students who wish to enter the field of business with a thorough knowledge of the essential principles of accounting; 2) to serve the needs of students in engineering and agriculture; 3) to introduce the "language" of business to arts and sciences majors; and 4) to provide a strong background for students preparing themselves for professional employment in public or private accounting, or as accountants in government service. The student majoring in accountancy may select courses which will prepare him specifically for one of these fields.

The accountancy courses are taught from a framework of modern business complexity so that the student becomes aware of the many factors entering into the "decision-making" process and the part the accountant and his skills contribute to administrative services.
# CURRICULUM IN ACCOUNTANCY

## Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>Freshman Composition (Eng 104, 105, 106)</td>
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<tr>
<td>Principles of Accounting (Acc 121, 122, 123)</td>
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<td>Physical Education (PE 141)</td>
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<tr>
<td>Calculating Machines (Bus 151)</td>
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<td>Management Principles (Bus 101)</td>
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<tr>
<td>Business Mathematics (Math 106)</td>
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<td>Health Education (PE 107)</td>
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<td>Basic Mathematics (Math 101)</td>
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<td>Marketing Principles (Mktg 201)</td>
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<td>Public Speaking (Sp 200)</td>
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**Natural Sciences**

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<td>Basic Mathematics (Math 101)</td>
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<td>Marketing Principles (Mktg 201)</td>
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## Sophomore

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<tr>
<td>Job and Process Cost Accounting (Acc 221)</td>
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<tr>
<td>Standard Costs and Analyses (Acc 222)</td>
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<td>Data Processing (DP 221)</td>
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<td>Intermediate Accounting (Acc 321, 322, 323)</td>
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<td>Business Communication (Eng 218)</td>
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**Literature**

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<th>Course</th>
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<tr>
<td>Principles of Economics (Ec 201, 202, 203)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Report Writing (Eng 216)</td>
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**Natural Sciences**

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<tr>
<td>Physics (PE 141)</td>
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## Junior

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<td>Credit Management (Fin 301)</td>
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<tr>
<td>Business Law (Bus 301, 302)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Money and Banking (Ec 308)</td>
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<td>Insurance Principles (Fin 303)</td>
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<tr>
<td>Budgeting Principles (Acc 226)</td>
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**Literature or Philosophy**

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<tr>
<td>Literature, Art, Philosophy or Music</td>
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<tr>
<td>Business Forecasting (Bus 311) or Descriptive Statistics</td>
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<tr>
<td>(Math 211)</td>
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## Senior

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<tr>
<td>Business Finance (Fin 314)</td>
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<tr>
<td>Federal Tax Course I (Acc 421)</td>
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<tr>
<td>Auditing (Acc 325, 326)</td>
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<td>Senior Project (Acc 461, 462)</td>
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<td>Undergraduate Seminar (Acc 463)</td>
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<td>Directed electives</td>
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<td>Electives</td>
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### Notes

* Unless already acceptable typists, majors will be required to take Bus 141 and/or 142 during their freshman year.

** To be selected from the General Education list.
DESCRIPTIONS OF COURSES IN ACCOUNTANCY

Acc 121, 122, 123 Principles of Accounting (3) (3) (3)
 Principles and practices of fundamental double-entry accounting. Problems approach to the subject with illustrations taken from real business situations. Provides information for analysis and allocation purposes. 2 lectures, 1 two-hour activity period.

Acc 221 Job and Process Cost Accounting (3)
 The cost accounting cycle; elements of cost of making a product; assignment of manufacturing costs to a product through job order and process cost systems. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 123

Acc 222 Standard Costs and Analyses (3)
 Standard and estimated cost accounting systems; analysis and control of distribution costs; differential cost analysis. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 123

Acc 223 Advanced Problems in Cost Accounting (3)
 Advanced problems in cost finding and cost control. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 222

Acc 226 Budgeting Principles (3)
 Principles and methods of preparing budgets, estimating income, and controlling expenditures of a manufacturing enterprise. Preparation of budgeted balance sheet and income statements. The duties of the sales, production, purchasing, and office managers in the planning and coordinating aspects of budgeting. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 123

Acc 232 Income Taxes (3)
 Federal and state income tax structure as related to individuals, including problems intended to provide an understanding of the principles. 2 lectures, 1 two-hour activity period. (Not applicable for credit toward major in accountancy.)

Acc 306 Accounting Systems (2)
 The installation and operation of accounting systems in business, with special attention to internal control. 2 lectures. Prerequisite: Acc 221, 322

Acc 321, 322, 323 Intermediate Accounting (3) (3) (3)
 Introduction to advanced theory of accounts and its application. Standards of practice and recent opinions of the American Institute of Certified Public Accountants. Modern financial statement terminology. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 123 and permission of instructor.

Acc 325, 326 Auditing Principles, Practices and Procedures (3) (3)
 Theory of auditing and its objectives; procedures and techniques to carry out the objectives; principles of working paper development and preparation; types of opinions rendered by auditors and their responsibilities. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 323

Acc 327 Internal Auditing (3)
 Principles of internal control; examination and appraisal of controls; systems designs; techniques of verification, working papers, and other features of auditing applicable to the internal auditor's work. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 222, 323, or consent of instructor.

Acc 400 Special Problems for Advanced Undergraduates (1-2)
 Individual or group investigations of special areas in accounting and related fields. Total credit limited to 4 units with not more than 2 units in any one quarter. Prerequisite: Senior standing or consent of instructor.
Acc 411, 412 Case Studies in Controllership (2) (2)
Analysis of accounting problems and business situations from the broad viewpoint of the controller. Studies of actual and simulated business case histories. 2 lectures. Prerequisite: Senior standing.

Acc 421 Federal Tax Course I (3)
Income, expenses, exclusions, deductions, and credits. Emphasis on individual returns. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 321

Acc 422 Federal Tax Course II (3)
Continuation of Acc 421. Emphasis on estates, trusts, partnerships and corporations. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 421

Acc 423 Governmental and Institutional Accounting (3)
Accounting for nonprofit institutions and governmental organizations. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 323

Acc 427 Budgetary Control (3)
Analysis of variances in budgetary control, including the break-even point, cost-volume relationships and the utilization of variable budgets. Current literature on budgetary control discussed. 3 lectures. Prerequisite: Acc 222, 322

Acc 431, 432, 433 Advanced Accounting (3) (3) (3)
Partnerships, joint ventures, home office and branch, consolidated financial statements, statement of affairs, receiverships, realization and liquidation statements, estates and trusts, and actuarial problems. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 323

Acc 441, 442 Internship in Accounting (2) (2)
On-the-job training with a business in the field of accounting. The experience must be new to the student so that learning takes place. Reports on various phases of the internship submitted as required by the faculty coordinator. Prerequisite: Permission of the instructor.

Acc 461, 462 Senior Project (2) (2)
Selection and completion of a project under minimum of supervision. Project typical of problems which graduates must solve in their fields of employment. Formal report is required. Required minimum of 120 hours.

Acc 463 Undergraduate Seminar (2)
Study and discussion by students of recent developments in the student's major fields. 2 meetings. Prerequisite: Senior standing or special permission.

Acc 475 C.P.A. Law Problems (3)
Business law questions given in the C.P.A. examination. Fundamental principles of the law of contracts, agency, bailments, sales, negotiable instruments, partnerships, corporations, real and personal property, wills, insurance, suretyship, bankruptcy and other subjects. 3 lectures. Prerequisite: Acc 433, Bus 302 or consent of instructor.

Acc 476 C.P.A. Auditing Problems (3)
Standards and objectives; reports; internal control; examination of internal and external records; working papers; procedures; and other related topics. 2 lectures, 1 two-hour activity period. Prerequisite: Acc 433 or consent of the instructor.

Acc 477 C.P.A. Practice Problems and Theory (6)
Contemporary accounting theory with emphasis upon pronouncements of the American Institute of Certified Public Accountants, the American Accounting Association, and the Securities and Exchange Commission. Application to advanced problems of the type found in the C.P.A. examinations. 2-two hour lectures. 2 two-hour activity periods. Prerequisite: Acc 433 or consent of instructor.
Arts and Sciences Division

ARTS AND SCIENCES PROGRAM

Rodman F. Garrity
Coordinator, Teacher Credential Programs
Jerome E. Dimitman, Head, Biological Sciences Department
Elmer H. Rice, Head, Physical Sciences Department
Fernando Penalosa, Acting Head, Social Sciences Department
Wallace A. Raab, Head, Mathematics Department
Ben Siegel, Head, Language Arts Department
Lowell K. Weeks, Chairman, Music and Art Department

The curriculum in Arts and Sciences is planned for those students who desire to obtain the General Elementary Credential. Only Arts and Sciences students who had 90 or more quarter hours of course credit upon entering the 1963 fall quarter at California State Polytechnic College, Kellogg Campus, are eligible to continue in this program. The deadline for these students to complete the Arts and Sciences Program is the spring quarter of 1966. All new students who plan to obtain an elementary credential must select the five-year program for the Standard Teaching Credential.

All students in the Arts and Sciences Program will have advisers appointed by the Coordinator of Teacher Credential Programs. Admission as a student in Arts and Sciences does not constitute admission to the teacher preparation program. Specific college criteria for admission to teacher credential programs may be obtained from the Coordinator of Teacher Credential Programs. Students must apply for admission to the elementary credential program in the junior year and select appropriate courses as noted. Students will find it advantageous to transfer to another curriculum at the junior level if at that time they do not meet admission requirements to the teacher preparation program. The student who completes the prescribed four-year program of studies will have an Arts and Sciences diversified major, composed of courses in several academic disciplines, and a General Elementary Credential.

Steps necessary for the General Elementary Credential:

Step 1. Apply for admission to Teacher Preparation Program in junior year of residence.

Step 2. Apply for approval to do student teaching one quarter before planning to student teach.

Step 3. Apply for teaching credential upon satisfactory completion of requirements.

CURRICULUM IN ARTS AND SCIENCES

(Freshman and Sophomore Years Not Offered)

<table>
<thead>
<tr>
<th>Junior</th>
<th>F</th>
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<tbody>
<tr>
<td>Child Growth and Development (Psy 305)</td>
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<tr>
<td>Educational Psychology (Psy 312)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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<tr>
<td>Natural Science (Bio 227, 228, 229)</td>
<td>4</td>
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<tr>
<td>Principles of Education (Ed 301)</td>
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<tr>
<td>Literature</td>
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<tr>
<td>Basic Music Skills (Mu 201)</td>
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<tr>
<td>Senior Project (Soc Sci 461)</td>
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<td>Electives</td>
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</table>

1 To be taken winter quarter, junior year. Select from 300 or 400 level courses in General Education list.
Senior (For students admitted to Teacher Preparation Program) | F | W | S
--- | --- | --- | ---
Senior Project (Soc Sci 462) | 2 | | |
Undergraduate Seminar (Soc Sci 463) | 2 | | |
Genetics (Bio 303) | 3 | | |
Literature and Oral Interpretation for Young People (Eng 427) | 4 | | |
Grammars of English (Eng 409) | 3 | | |
Methods in Elementary Education (Ed 420, 421, 422) | 3* | 3* | 3*
Adolescent Psychology (Psy 306) | 3 | | |
Music Literature for Children (Mu 436) | 3 | | |
Student Teaching (Ed 431) | 12** | | |
Electives | 5 | 1 | 2
| 16 | 16 | 17

* The Elementary Teacher Education Selection Committee must take action on any deviation from the method course sequence in the fourth year.
** The Elementary Teacher Education Selection Committee must take action on any deviation from this student teaching schedule.
A four-year curriculum leading to the Bachelor of Science Degree in Biological Sciences with options in Botany, Biology, Bacteriology, and Zoology is offered by the department. In addition, a wide variety of courses is offered to support other major departments. Curricular requirements are designed to provide a broad and fundamental basis essential to an understanding of the field of biology, yet allow sufficient latitude, through a wide selection of electives, for concentration in various fields. Agricultural majors obtain sufficient background in bacteriology, botany, entomology, plant pathology and zoology to understand the basic principles involved in their applied courses. Courses are offered to fulfill the general education requirements in life science, and adequate undergraduate preparation is provided for beginning work at the graduate level. The departmental facilities include laboratories provided with modern scientific equipment, and greenhouses for practical work in the plant sciences. The campus is centrally located for field work in desert, mountain, seashore and coastal locations.

**CURRICULAR OPTIONS**

**Biology**
This option prepares the student for elementary or secondary teaching and for employment in many diverse areas of life science, including Plant Inspection, Quarantine, Park and Forest Service work, and related positions.

**Botany**
This option leads to preparation for work in the plant sciences such as mycology, plant pathology, plant physiology, and taxonomy.

**Bacteriology**
This option prepares the student for employment in microbiology and related areas as in public health, sanitation, the industrial and pharmaceutical industries, and medical and research laboratory work. It also prepares the student for entrance into graduate schools in microbiology, and into medical and dental schools.

**Zoology**
This option prepares the student for work in various fields of animal science, such as fish and game, wildlife, entomology, museum work, and conservation. It also prepares the student for graduate and pre-professional schools.

**CURRICULUM IN BIOLOGICAL SCIENCES**

<table>
<thead>
<tr>
<th>Freshman</th>
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<tr>
<td>Freshman Composition (Eng 104, 105, 106)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>Basic Biology (Bio 115)</td>
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<td>Basic Biology Laboratory (Bio 145)</td>
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<tr>
<td>General Chemistry (Chem 321, 322)</td>
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<tr>
<td>Basic Mathematics (Math 101)</td>
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<td>Basic Math for General Education (Math 112)</td>
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<tr>
<td>General Zoology (Zoo 134, 135)</td>
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<tr>
<td>Organic Chemistry (Chem 326)</td>
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## California State Polytechnic College

### Sophomore

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<th>Course</th>
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<tr>
<td>Physical Education (PE 141)</td>
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<td>General Botany (Bot 124, 125)</td>
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<td>Genetics (Bio 303)</td>
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<td>General Entomology (Ent 126)</td>
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<td>College Physics (Phys 121, 122, 123)</td>
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<tr>
<td>* Literature</td>
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<tr>
<td>Literature, Philosophy, Art, or Music</td>
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<tr>
<td>Principles of Economics (Ec 201, 202)</td>
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<td>Public Speaking (Sp 200)</td>
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<td><strong>Total</strong></td>
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### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>General Bacteriology (Bact 221)</td>
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<tr>
<td>Principles of Evolution (Bio 213)</td>
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<tr>
<td>Descriptive Statistics (Math 211)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>General Psychology (Psy 202)</td>
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<tr>
<td>Biochemistry I (Chem 328)</td>
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<td>Electives and courses to complete major</td>
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### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Cellular Physiology (Bio 335)</td>
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<tr>
<td>Plant and Animal Ecology (Bio 325)</td>
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<tr>
<td>Taxonomy of Higher Plants (Bot 343)</td>
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<tr>
<td>Senior Project (Bio 461, 462)</td>
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<tr>
<td>Undergraduate Seminar (Bio 463)</td>
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<td>Electives and courses to complete major</td>
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<td><strong>Total</strong></td>
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### Biology Option (Add Courses Below to Basic Curriculum)

#### Sophomore

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<th>Course</th>
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<tbody>
<tr>
<td>Bio 200 History of Biology (2)</td>
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<tr>
<td>Bio 201 Conservation of Natural Resources (3)</td>
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#### Junior

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<th>Course</th>
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<tr>
<td>Bio 332 Fresh Water Biology (4)</td>
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<tr>
<td>Bio 341-2 Biotechniques (4)</td>
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#### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Ent 334 Advanced Entomology (3)</td>
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<tr>
<td>Zoo 226 Vertebrate Field Zoology (4)</td>
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<tr>
<td>Zoo 329 Ornithology (3)</td>
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### Botany Option (Add Courses Below to Basic Curriculum)

#### Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Bot 236 Families of Flowering Plants (3)</td>
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<tr>
<td>Path 223 General Plant Pathology (4)</td>
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#### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Bot 307 Economic Botany (3)</td>
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<tr>
<td>Bot 322 Plant Physiology (4)</td>
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</table>

* To be selected from General Education list.
### Bacteriology Option (Add Courses Below to Basic Curriculum)

#### Sophomore
- Bio 225 Microtechnique (3)
- Bact 322 Dairy Bacteriology (4)
- Bact 332 Soil Microbiology (4)
- Bact 333 Sanitary and Industrial Bacteriology (3)

#### Junior
- Bot 426 Mycology (4)
- Bot 427 Medical Mycology (4)

#### Senior
- Bact 423 Public Health Microbiology (4)
- Bact 424 Food Microbiology (4)
- Bact 425 Parasitology (4)
- Zoo 329 Ornithology (3)
- Zoo 435 Arthropod Vectors (3)

### Zoology Option (Add Courses Below to Basic Curriculum)

#### Sophomore
- Zoo 224 Animal Physiology (4)
- Zoo 226 Vertebrate Field Zoology (4)

#### Junior
- Zoo 236 Invertebrate Zoology (4)
- Zoo 323 Embryology (4)

#### Senior
- Zoo 329 Ornithology (3)
- Zoo 422 Histology (4)
- Zoo 425 Parasitology (4)

### Descriptions of Courses in Bacteriology

**Bact 221 General Bacteriology (4)**
- Morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man, animals, and plants. 2 lectures, 2 laboratories. Prerequisite: Bio 145, Chem 321 or 324

**Bact 322 Dairy Bacteriology (4)**
- Microorganisms involved in dairy products, milk, milk powders, butter, cheese, ice cream and casein adhesives. 2 lectures, 2 laboratories. Prerequisite: Bact 221

**Bact 332 Soil Microbiology (4)**
- Methods of studying soil microflora-plant rhizosphere relationships; methods of sampling and isolating microorganisms from soil; assay of antibiotics from antagonistic soil microorganisms. 2 lectures, 2 laboratories. Prerequisite: Bact 221, Chem 326

**Bact 333 Sanitary and Industrial Bacteriology (3)**
- Sanitary and industrial application of microbiology stressing food, dairy, water, air, and sewage; practical aspects of environmental sanitation emphasized. 2 lectures, 1 laboratory. Prerequisite: Bact 221

**Bact 423 Public Health Microbiology (4)**
- Detailed study of pathogenic fungi, bacteria, rickettsia, and viruses in relation to public health. 2 lectures, 2 laboratories. Prerequisite: Bact 221

**Bact 424 Food Microbiology (4)**
- The microbiology of food stuffs as related to storage, transit, and animal and human nutrition. 2 lectures, 2 laboratories. Prerequisite: Bact 221

### Descriptions of Courses in Biology

**Bio 110 Applied Biology (3)**
- Biology of man with application to engineering and industry. 3 lectures.

**Bio 115 Basic Biology (3)**
- Introduction to living things; basic structure and function of plants and animals and their relationship to the physical world. 3 lectures.

*Offered in odd-numbered years only.*
Bio 145 Basic Biology Laboratory (2)
Laboratory techniques in the study of cells, plant and animal structure and functions. 2 laboratories. Prerequisite: To be taken concurrently with or after Bio 115

Bio 200 History of Biology (2)
Chronological résumé of events, inventions, discoveries, and workers contributing to growth of biological sciences. Less emphasis on purely medical events than those of general biological importance. 2 lectures.

** Bio 201 Conservation of Natural Resources (3)
Fundamental concepts, practices, local and national laws concerning conservation of natural resources of the United States with emphasis on California and the western states. 3 lectures. Prerequisite: Consent of instructor.

Bio 213 Principles of Evolution (3)
Introduction to plant and animal evolution. 3 lectures. Prerequisite: Bio 145

Bio 225 Microtechnique (3)
Methods of preparing plant and animal tissues for microscopic study. 1 lecture, 2 laboratories. Prerequisite: Bio 145

Bio 227 Natural Sciences (4)
Scope of field biology; study of the environment of plants and animals through identification of land forms, rocks, components of weather and climate, and the physical aspect of oceans; classification and identification of the major groups of animals. Understanding the importance of conservation of natural resources. 2 lectures, 2 laboratories. Prerequisite: Bio 115

Bio 228 Natural Sciences (4)
Basic principles of ecology and natural history with emphasis on classification and identification of major plant groups; study of natural communities with emphasis on interrelations between organisms and their environment; study of relationships within and among biological communities. 2 lectures, 2 laboratories. Prerequisite: Bio 227

Bio 229 Natural Sciences (4)
Natural History of California; field examination of representative natural communities, with detailed study of plants and animals associated with each; emphasis on identification of plants, animals and environmental factors. 2 lectures, 2 laboratories. Prerequisite: Bio 228

Bio 303 Genetics (3)
Principles of heredity and variation. 3 lectures. Prerequisite: Bio 115

Bio 325 Plant and Animal Ecology (3)
Response of plants and animals to their environment. 2 lectures, 1 laboratory. Prerequisite: Bot 124 or Zoo 134

* Bio 332 Fresh Water Biology (4)
Ecology, taxonomy, morphology and natural history of major plant and animal groups in various fresh water habitats, and their relationship to fisheries, wildlife management, water sanitation, and conservation. 2 lectures, 2 laboratories. Prerequisite: Bot 125, Zoo 134 and 135

* Bio 335 Cellular Physiology (4)
Physical mechanisms at the cellular level. 2 lectures, 2 laboratories. Prerequisite: Chem 328

* Offered in odd-numbered years only.
** Offered in even-numbered years only.
Bio 341 Biotechniques (2)
Botanical techniques; collecting, preservation, preparation of botanical specimens. 2 laboratories. Prerequisite: Bot 124

Bio 342 Biotechniques (2)
Zoological techniques; collecting, preservation, preparation of zoological specimens. 2 laboratories. Prerequisite: Zoo 134

Bio 343 Biotechniques (2)
Zoological-botanical techniques; collection, preservation, identification and maintenance of plant and animal specimens for classroom use. 2 laboratories. Open only to secondary school teacher candidates with Minor in Biological Science.

Bio 352 Genetics Laboratory (2)
Laboratory techniques in genetics. 2 laboratories. Taken concurrently with or after Bio 303

Bio 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories. Prerequisite: Senior standing or consent of instructor.

* Bio 421 Advanced Genetics (3)
Continuation of studies in genetics with emphasis at the biochemical level. Further work on mutations, chromosomal aberrations, radiation effects and their use in plant and animal studies. Laboratories emphasize techniques in bacterial, viral and Neurospora genetics. 3 lectures. Prerequisite: Bio 303

Bio 423 General Cytology (4)
Detailed study of plant and animal cells, structurally and functionally. 2 lectures, 2 laboratories. Prerequisite: Bot 124 and Zoo 134

Bio 431 Radiation Biology (3)
Introduction to radioisotope techniques, radiometric analyses, radiation safety and health physics as applied to life sciences and public health. 1 lecture, 2 laboratories. Prerequisite: Bio 145 and Chem 321

** Bio 432 Isotope Tracers (3)
Use of radio isotopes with special emphasis on agricultural applications. Plant and soil science techniques and methods utilizing radiometric analyses. 1 lecture, 2 laboratories. Prerequisite: Bio 431, or Chem 334

Bio 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment with results presented in a formal report. Minimum of 120 hours total time.

Bio 463 Undergraduate Seminar (2)
Study and discussion of recent developments in the field of biology. 2 meetings. Prerequisite: Bio 462

Bio 521 Curriculum and Methods in the Biological Sciences (3)
Curricula, methods, devices, and procedures that may be used effectively in organizing and conducting high school biology courses. 2 lectures, 1 laboratory. Prerequisite: Graduate standing and admission to teacher preparation program.

Bio 590 Seminar in Biology (1-2)
Arrangements to be made with faculty. Topics in disciplines of biology offered according to interests and needs of students. Each seminar to have a sub-title identifying the discipline. 1-3 units in one quarter, maximum of 9 units. Prerequisite: Graduate standing.

* Offered in odd-numbered years only.

** Offered in even-numbered years only.
Bot 116 Basic Concepts of Taxonomy (1)
Gross morphology and taxonomy of flowering plants as applied to the study of plant materials. 1 laboratory.

Bot 120 Agricultural Botany (4)
Principles of structure, function, and classification of seed plants and fungi with special application to agriculture. 3 lectures, 1 laboratory. Prerequisite: Bio 145

Bot 124 General Botany (5)
Structure and function of plants. 3 lectures, 2 laboratories. Prerequisite: Bio 145

Bot 125 General Botany (5)
Comparative morphology and phylogenetic relationships of plant groups from bacteria to angiosperms. 3 lectures, 2 laboratories. Prerequisite: Bio 145

Bot 236 Families of Flowering Plants (3)
Recognition of the major orders and families of flowering plants. 1 lecture, 2 laboratories. Prerequisite: Bio 145 or Bot 116

* Bot 249 Taxonomy of Grasses (2)
Structure and variation in grasses. Use of a key in identification. Recognition of tribes of the grass family. Use of vegetative characters in identification of common hay and pasture grasses. 2 laboratories. Prerequisite: Bio 145

* Bot 307 Economic Botany (3)
Sources and uses of plant products utilized by man. 3 lectures. Prerequisite: Bio 145

Bot 322 Plant Physiology (4)
Functions of plants; water relations, metabolism and plant growth. 3 lectures, 1 laboratory. Prerequisite: Bot 120 or 124

* Bot 334 Morphology of Vascular Plants (4)
Evolution of the plant kingdom as illustrated by comparative morphology of major plant groups. 2 lectures, 2 laboratories. Prerequisite: Bot 125

* Bot 335 Plant Anatomy (4)
Microscopic study of representative common plants dealing with origin, development, and structure of cells, tissues and tissue systems in roots, stems, and leaves. 2 lectures, 2 laboratories. Prerequisite: Bot 124

Bot 343 Taxonomy of Higher Plants (3)
General principles of classifications of plants; procedures for identification of unknown plants; preparation and use of specimens. 1 lecture, 2 laboratories. Prerequisite: Bot 116, Bot 120, Bot 124 or Bot 125

Bot 426 Mycology (4)
Morphological, cultural, and pathological characteristics of fungi. 2 lectures, 2 laboratories. Prerequisite: Bot 122 or consent of instructor.

* Bot 427 Medical Mycology (4)
Characteristics, habits and laboratory identification of fungi inciting human and animal diseases. 2 lectures, 2 laboratories. Prerequisite: Bact 221

* Offered in odd-numbered years only.
** Offered in even-numbered years only.
DESIGNATIONS OF COURSES IN ENTOMOLOGY

Ent 126 General Entomology (4)
Basic principles of insect classification, with a survey of the orders and important families. Structure, development, and behavior of insects. General principles of control. 2 lectures, 2 laboratories.

**Ent 331 Insect Taxonomy (3)**
Classification of insects; taxonomic categories and procedures; nomenclature and literature. 1 lecture, 2 laboratories. Prerequisite: Ent 126

Ent 334 Advanced Entomology (3)
Immature insects of economic importance; methods of evaluating control procedures, principles of biological control; insect ecology. 2 lectures, 1 laboratory. Prerequisite: Ent 126

Ent 423 Structure and Function in Insects (4)
Comparative anatomy and physiology of insects. 2 lectures, 2 laboratories. Prerequisite: Ent 126

DESIGNATIONS OF COURSES IN PLANT PATHOLOGY

Path 223 General Plant Pathology (4)
Principles of the nature and control of plant diseases caused by bacteria, fungi, nematodes, viruses, and physiological factors. 2 lectures, 2 laboratories. Prerequisite: Bot 120 or 125

Path 324 Advanced Plant Pathology (4)
Methods and materials used in the diagnosis of plant diseases; special reference to techniques for differentiation of plant disease problems. 2 lectures, 2 laboratories. Prerequisite: Path 223

* Path 335 Fungi Attacking Wood Products (3)
Recognition and identification of fungi found in timber products. Types of damage, means of prevention, and control measures. 2 lectures, 1 laboratory.

** Path 423 Plant Nematology (3)
Classification of nematodes associated with economic plants; basic morphology, biology and control of important plant nematodes. 2 lectures, 1 laboratory. Prerequisite: Path 223 and Zoo 135

DESIGNATIONS OF COURSES IN ZOOLOGY

Zoo 134 General Zoology (4)
Structure and function of vertebrate organ systems, with emphasis on man and domestic animals; study of interrelationships within the Phylum Chordata. 2 lectures, 2 laboratories. Prerequisite: Bio 145

Zoo 135 General Zoology (4)
Invertebrate animals from Protozoa to Chordates. Study of the variety and distribution of invertebrate life, with emphasis on those forms of economic and medical importance. 2 lectures, 2 laboratories. Prerequisite: Bio 145

Zoo 224 Animal Physiology (4)
Introduction to functions of vertebrate and invertebrate organ systems. 2 lectures, 2 laboratories. Prerequisite: Zoo 134, 135

* Offered in odd-numbered years only.
** Offered in even-numbered years only.
Zoo 226  Vertebrate Field Zoology (4)
Identification, life histories, and economic importance of vertebrates. Field work emphasized. 2 lectures, 2 laboratories, and field work. Prerequisite: Zoo 134

Zoo 234, 235  Human Anatomy and Physiology (4) (4)
Structure and function of organ systems of man. Planned for Physical Education and non-biological science majors. 3 lectures, 1 laboratory. Prerequisite: Bio 145

Zoo 236  Invertebrate Zoology (4)
A systematic and comparative survey of all invertebrate groups, including the minor phyla, with emphasis on morphology and phylogeny. (Insects and parasites are omitted.) 2 lectures, 2 laboratories and field work.

** Zoo 323  Embryology (4)
Embryonic development of the vertebrate body. 2 lectures, 2 laboratories. Prerequisite: Zoo 134

Zoo 326  Comparative Anatomy of Vertebrates (4)
Comparative structure of vertebrate organ systems. 2 lectures, 2 laboratories. Prerequisite: Zoo 134

** Zoo 329  Ornithology (3)
Identification, structure, physiology, ecology, behavior and economic importance of birds, especially of Pacific Coast region. 2 lectures, 1 laboratory or field exercises and field project. Prerequisite: Zoo 134

Zoo 422  Histology (4)
Microscopic study of vertebrate tissues: organology and correlation of form with function. 2 lectures, 2 laboratories. Prerequisite: Zoo 134

Zoo 425  Parasitology (4)
Study of the protozoan and helminth parasites of man and lower animals. Life histories, control, epidemiology and economic importance. 2 lectures, 2 laboratories. Prerequisite: Zoo 135

Zoo 435  Arthropod Vectors (3)
Role of insects, mites, ticks and other arthropods in causation and transmission of human diseases. Classification, structure, and life histories of arthropods and parasites. 2 lectures, 1 laboratory. Prerequisite: Ent 126 or Zoo 425

* * Offered in even-numbered years only.
The Business Management program prepares students for employment in the administrative and technical functions of both small and large business. The curriculum provides opportunities for employment in the business community. Specialized course work is designed to shorten the essential period of apprenticeship all executives must serve. Correlated theory and practice are provided early in the program so that the student will know both the why and how of business operation.

The course offerings of this department enable the graduate to understand the basic principles of business and realize the close relationship among the various aspects of the business world. Students are prepared for a wide range of positions in industry, commerce, finance, insurance, real estate, secondary education, data processing, and public service; e.g., proprietors-manager, management trainee, executive trainee, department head in a large business, purchasing agent, department store buyer, credit manager, office manager, contract administrator, bank manager, real estate manager, records supervisor, systems analyst, programmer, business teacher in secondary schools, and executive secretary. In addition to a wide offering of courses in business the student selects courses from the general education list to help him better understand his relationships in society and his responsibilities as a citizen in a community.

The student will select an option in Industrial Management; Finance, Insurance and Real Estate; Data Processing; or Office Management to complete the curriculum.

**CURRICULAR OPTIONS**

**Industrial Management**

The student takes courses providing him background in industrial operations and techniques to equip him for management occupations in industry.

**Office Management**

This option provides skills and background needed by the executive office manager. By choice of additional courses the student may be prepared to seek qualification as a Certified Professional Secretary.

**Finance, Real Estate and Insurance**

The courses in this option prepare the student for employment in this growing occupational area. Elective courses may be used to enhance any of the three sub-areas.

**Data Processing**

The option in Data Processing provides entry employment opportunities in this significant aspect of modern business activity.
## CURRICULUM IN BUSINESS MANAGEMENT

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
<th>F</th>
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<tbody>
<tr>
<td>Freshman Composition (Eng 104, 105, 106)</td>
<td>3</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>Management Principles (Bus 101)</td>
<td>3</td>
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<tr>
<td>Principles of Accounting (Acc 121, 122, 123)</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Office Administration (Bus 121)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>* Mathematics (Math 101, 106)</td>
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<tr>
<td>** Natural Sciences</td>
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<tr>
<td>Public Speaking (Sp 200)</td>
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<tr>
<td>Business Computations (Bus 151)</td>
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<td>** Total</td>
<td>15½</td>
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### Sophomore

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<th>Course</th>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>Marketing Principles (Mktg 201, 202)</td>
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<tr>
<td>Business Communication (Eng 218)</td>
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<td>Principles of Economics (Ec 201, 202, 203)</td>
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<td>Introduction to Data Processing (DP 211)</td>
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<tr>
<td>General Psychology (Psy 202)</td>
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<td>** Natural Sciences</td>
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### Junior

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Human Relations (Psy 304)</td>
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<tr>
<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Business Law (Bus 301, 302)</td>
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<td>Business Forecasting (Bus 311)</td>
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<tr>
<td>Business Forecasting (Bus 312)</td>
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<tr>
<td>Business Finance (Fin 314)</td>
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<tr>
<td>Managerial Accounting (Bus 306)</td>
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<tr>
<td>Management Processes (Bus 305)</td>
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### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Literature, Philosophy, Fine and Practical Arts</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Senior Project (Bus 461, 462)</td>
<td>2</td>
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<tr>
<td>Undergraduate Seminar (Bus 463)</td>
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<td>** Total</td>
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## INDUSTRIAL MANAGEMENT OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

### Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IE 111 Industrial Engineering (3)</td>
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<tr>
<td>IE 122 Motion Study (3)</td>
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<tr>
<td>DP 222 Systems Analysis (3)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Acc 226 Budgeting Principles (3)</td>
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### Sophomore

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IE 214 Industrial Incentives (3)</td>
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<tr>
<td>IE 236 Production Planning and Control (4)</td>
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<td>Mktg 302 Industrial Marketing (3)</td>
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<td>Mktg 304 Traffic Management (3)</td>
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<tr>
<td>Bus 313 Industrial Supervision (3)</td>
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<tr>
<td>Bus 401 Business Policies and Management (3)</td>
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<tr>
<td>Fin 404 Corporation Finance (3)</td>
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### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Acc 221 Job and Process Cost Accounting (3)</td>
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* Math 117 may be substituted for Math 101.
** To be selected from the General Education list.
## Arts and Sciences Division

### OFFICE MANAGEMENT (ADD COURSES BELOW TO BASIC CURRICULUM)

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Freshman</td>
<td>Bus 122 Office Administration</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Bus 141-2 Typewriting</td>
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<td></td>
<td>Bus 153 Office Machines</td>
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<tr>
<td>Sophomore</td>
<td>Eng 216 Report Writing</td>
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<tr>
<td></td>
<td>Acc 221 Job and Process Cost Accounting</td>
<td>(3)</td>
</tr>
<tr>
<td>Junior</td>
<td>Bus 313 Industrial Supervision or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABM 402 Personnel Management (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DP 222 Systems Analysis</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Acc 226 Budgeting Principles</td>
<td>(3)</td>
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<tr>
<td>Sophomore</td>
<td>Fin 301 Credit Management</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 303 Insurance</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Bus 401 Business Policies and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 404 Corporation Finance</td>
<td>(3)</td>
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<tr>
<td>Senior</td>
<td>Fin 302 Real Estate</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 303 Insurance Principles</td>
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<td></td>
<td>ABM 402 Personnel Management (3)</td>
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<tr>
<td></td>
<td>Acc 321 Intermediate Accounting or</td>
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<td></td>
<td>Acc 332 Income Taxes</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Ec 308 Money and Banking</td>
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### FINANCE, REAL ESTATE AND INSURANCE OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
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<tbody>
<tr>
<td>Freshman</td>
<td>Fin 301 Credit Management</td>
<td>(3)</td>
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<tr>
<td>Sophomore</td>
<td>Fin 302 Real Estate</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 303 Insurance Principles</td>
<td>(3)</td>
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<tr>
<td></td>
<td>ABM 402 Personnel Management (3)</td>
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<tr>
<td>Junior</td>
<td>Acc 321 Intermediate Accounting or</td>
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<tr>
<td></td>
<td>Acc 332 Income Taxes</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Ec 308 Money and Banking</td>
<td>(3)</td>
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<tr>
<td>Senior</td>
<td>Fin 404 Corporation Finance</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 405 Investment Analysis</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 406 Law of Trusts and Estates</td>
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<td>ABM 406 Land Appraisal and Sales</td>
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<td>Fin 407 Real Estate Law</td>
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<td>Fin 409 Property and Liability Insurance</td>
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<td>Fin 413 Life Insurance</td>
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<tr>
<td></td>
<td>Fin 416 Comparative Financial Institutions</td>
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### DATA PROCESSING OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>Freshman</td>
<td>Phil 202 Logic</td>
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<tr>
<td>Sophomore</td>
<td>Phil 205 Symbolic Logic and</td>
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<tr>
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<td>Acc 321-2-3 Intermediate Accounting</td>
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<tr>
<td></td>
<td>DP 311 Computer Programming for Business</td>
<td>(3)</td>
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<td>DP 313 Critical Path Scheduling Methods</td>
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<tr>
<td>Senior</td>
<td>Acc 321-2-3 Intermediate Accounting</td>
<td>(9)</td>
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<tr>
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<td>Bus 401 Business Policies and</td>
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<tr>
<td></td>
<td>Management</td>
<td>(3)</td>
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<tr>
<td></td>
<td>Fin 404 Corporation Finance</td>
<td>(3)</td>
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<tr>
<td></td>
<td>IE 416 Introduction to Operations Research</td>
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### DESCRIPTIONS OF COURSES IN BUSINESS MANAGEMENT

**Bus 101 Management Principles (3)**

Significance and responsibilities of business. Management functions and principles as applied to all areas of the business enterprise. 3 lectures.

**Bus 121, 122 Office Administration (3) (3)**

Basic office procedures and practices. Knowledge and techniques necessary to work in or manage a business office. Practice with machines and application of procedures commonly found in the office. 2 lectures, 1 activity period.

**To be selected from the General Education list.**
Bus 141, 142, 143 Typewriting (1) (1) (1)
Fundamentals of the touch system. Training in preparing business forms and business letters. 2 one-hour activity periods.

Bus 151 Business Computations (1)
Experience in the use and selection of adding and listing machines and rotary and printing calculators. Application of this experience to problems in interest, depreciation, sinking funds, annuities. 2 one-hour activity periods.

Bus 153 Office Machines (1)
The use of the latest types of mechanical equipment found in the business office. Dictating, transcribing, various types of duplicating machines, and other machines commonly used in business. 1 laboratory.

Bus 203 Small Business Organization and Management (3)
How to organize and operate a small business. Small business hazards and factors in business success are studied. Adequate protection and financing for the small business. 3 lectures.

Bus 244, 245, 246 Shorthand (2) (2) (2)
The most effective techniques for recording and transcribing personal dictation. 4 hours activity. Prerequisite: Bus 245, Bus 244 or 60 wpm; Bus 246, Bus 245 or 80 wpm.

Bus 301 Business Law (3)
The nature and sources of law. The law of contracts, including offer and acceptance, consideration, competent parties, illegality, fraud, mistake and duress, and performance and discharge. The law of sales including transfer of property between buyer and seller, warranties, remedies. Emphasis on California law. Casebook method. 3 lectures. Prerequisite: Junior standing or consent of instructor.

Bus 302 Business Law (3)
Law of negotiable instruments, partnerships, and corporations. Emphasis on California law. Casebook methods used. 3 lectures. Prerequisite: Bus 301 and Acc 122

Bus 305 Management Processes (3)
Organization and organizational theory of a commercial or industrial enterprise; advanced planning; methods of management control; business decisions. Interdepartmental coordination and communication. Case studies. 3 lectures. Prerequisite: Bus 101

Bus 306 Managerial Accounting (3)
Accounting as a managerial tool, including budget, cost, and profit interpretation. 3 lectures. Prerequisite: Acc 123

Bus 311, 312 Business Forecasting (3) (3)
Application of frequency distributions, construction and use of index numbers, relationships between time series, sampling, reliability, significance, budgeting, and forecasting from a practical business point of view. Methods of presentation of business data. 3 lectures. Prerequisite: Bus 311

Bus 313 Industrial Supervision (3)
A study of the concepts, techniques, and theories of supervision of personnel. The role of staff departments in assisting line managers in the personnel functions of employment, training, wage administration, and other activities pertaining to employer-employee relations. 3 lectures.

Bus 321, 322, 323 Advanced Secretarial Practice (4) (4) (4)
Individual activities similar to those of an actual office. Practical application of the secretarial skills, including use of typewriter, adding machines or calculators, filing, duplicating machines, shorthand, machine dictation, shorthand transcription and machine transcription. 2 lectures and 2 laboratories. Prerequisite: Junior standing or consent of instructor.
Bus 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation of special areas in the field of business. Total credit limited to four units with not more than two units in any one quarter. Prerequisite: Senior standing and consent of instructor.

Bus 401 Business Policies and Management (3)
A case study approach to current administrative and management problems and policies. All phases of business—marketing, sales, finance, personnel organization, procurement, facilities and budgetary control are involved. 3 lectures. Prerequisite: Senior standing.

Bus 402 Inventory Control (2)
Management problems of production, maintaining proper control records, financing, and materials handling and storage. 2 lectures.

Bus 441, 442 Internship in Business Management (2) (2)
On-the-job training with a business in some phase of business management. The experience must be new to the student so that learning takes place. Analytical reports of work accomplished by each student are made periodically to the faculty coordinator. Prerequisite: Permission of the instructor.

Bus 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Formal report is required. Prerequisite: Senior standing. Required minimum of 120 hours.

Bus 463 Undergraduate Seminar (2)
Study and discussion by students of recent developments in the student's major fields. 2 lectures. Prerequisite: Senior standing or special permission. Offered only in Spring Quarters.

Bus 521 Curriculum and Methods in Secondary Business Subjects (3)
Objectives, organization, and content of business curriculum in secondary schools. Methods of teaching, materials, and evaluation of procedures. 3 lectures. Prerequisite: Admission to teacher education program and graduate standing.

Bus 590 Seminar in Business Education (3)
Identification and analysis of problems in the organization, administration, and teaching of business subjects in secondary schools. Current trends. Directed research. 3 lectures. Prerequisite: Bus 521. May be repeated for maximum credit of 6 units.

DESCRIPTIONS OF COURSES IN DATA PROCESSING

DP 211 Introduction to Data Processing (3)
The functions and application of data processing equipment in modern business. Understanding punched card machines and computers as management tools for high speed processing of accounting, marketing, and other information. 3 lectures. Prerequisite: Acc 123, Bus 121

DP 222 Systems Analysis (3)
Initiating, planning, executing, and implementing systems improvements in business. Analysis of business systems from a "total systems" concept using techniques such as flow charting, procedural analysis, and simplification studies. 2 lectures, 1 activity period. Prerequisite: DP 211

DP 223 Electronic Data Processing Systems (3)
Study of applications of computers to complex systems and large clerical operations. Equipment evaluation, feasibility studies, and conversion problems. 2 lectures, 1 activity period. Prerequisite: DP 222
DP 311 Computer Programming for Business (3)
Applications of the IBM 1620 to business data processing problems. Use of SPS (Symbolic Programming System) as a business oriented programming language. Block diagramming and programming representative business problems for solution on a 1620 computer. 3 lectures. Prerequisite: DP 211

DP 313 Critical Path Scheduling Methods (3)
Representation of inter-related activities as a network of events. Network construction, analysis, and maintenance. Use of the computer to determine the critical path and provide management reports. Latest CPM techniques as evolved from PERT and PERT-COST. 3 lectures. Prerequisite: DP 223, 311

DESCRIPTIONS OF COURSES IN FINANCE, REAL ESTATE, AND INSURANCE

Fin 301 Credit Management (3)
Problems of the credit manager in reducing credit risks, determining sources of credit information, application of credit terms, laws relating to credit instruments, and collection problems. 3 lectures. Prerequisite: Acc 123

Fin 302 Real Estate (3)
The nature and classification of property rights. Property ownership. Financing real estate. How to operate a real estate business. 3 lectures.

Fin 303 Insurance Principles (3)
Principles of insurance as they affect the conduct of a business. Coverage of risks on materials and merchandise, transportation and business interruption. 3 lectures.

Fin 314 Business Finance (3)
Monetary and banking principles as they apply to the problems of financing business, including promotion, types of organization, long and short-term capital, dividends, involvements, and expansion. 3 lectures. Prerequisite: Acc 123

Fin 404 Corporation Finance (3)
Principles of determining most desirable channels for the management and investment of business funds. Analysis and evaluation of corporate securities and their price fluctuation. 3 lectures. Prerequisite: Fin 314 or consent of instructor.

Fin 405 Investment Analysis (3)
Analysis and evaluation of corporate securities and their price fluctuation. 3 lectures. Prerequisite: Fin 404

Fin 406 Law of Trusts and Estates (3)
Legal problems concerning the disposal of estates of deceased persons by will and under statutes of descent and distribution, probating estates of deceased persons, creation of trusts, both inter vivos and testamentary, duties and liabilities of trustees, rights of beneficiaries of trust. 3 lectures. Prerequisite: Bus 302

Fin 407 Real Estate Law (3)
Rights and liabilities surrounding the acquisition, possession and transfer of real property. Definition and description of land including easements, deeds, recording, covenants in deeds, zoning ordinances, contracts for sales of land, evidence of title, escrow transactions, mortgages, foreclosure and redemption, liens, community property, descent, landlord and tenant. Emphasis on California law. 3 lectures. Prerequisite: Fin 302

Fin 409 Property and Liability Insurance (3)
Personal and business applications of the various types of property and liability insurance. Emphasis on surveying procedures and integrated insurance planning. 3 lectures. Prerequisite: Fin 303
Fin 413  Life Insurance  (3)
Personal and business applications of the various types of life insurance. Emphasis on estate and family planning. Provides background for CLU examinations. 3 lectures. Prerequisite: Fin 303

Fin 416  Comparative Financial Institutions  (3)
A study of financial institutions as sources of funds; corporate supervision of funds; growth and development of insurance companies; consumer credit institutions, mortgage companies, inventory financing institutions. 3 lectures. Prerequisite: Ec 308
Courses in English, speech, and journalism are designed to serve three purposes: (1) to help the student develop habits of sound thinking and logical organization of material; (2) to provide opportunities for the student to use language accurately, clearly, and interestingly in speaking and writing; and (3) to develop the techniques of reading to the point of understanding others' ideas and using those ideas effectively. The department aims to provide both major and service courses in the fields of English, speech, and journalism and to offer appropriate courses in these fields to meet the general-education needs of students in other majors.

The English 104-105 course sequence is required of all students except those who enter with credit in freshman composition. In addition, one of the following is required: English 106, 216, 218, 219 or Speech 200 or 300. Other courses are offered for department patterns and as electives.

A placement test is given to aid in the assignment of students to the appropriate level of training in language communications. Students who demonstrate considerable deficiency will be assigned to English 4, a preparatory course without credit toward a degree. A passing grade in this course entitles the student to advance to Freshman Composition.

The student majoring in Language Arts will elect an option in Journalism, Speech, or Literature-Language.

CURRICULAR OPTIONS

Journalism
The journalism option is designed to prepare students for secondary school teaching and for jobs in such journalistic enterprises as community newspapers and technical and house organs.

Speech
The speech option is designed to prepare students to teach speech and related subjects at the secondary level. It includes preparation in the methods and techniques of oral interpretation, forensics, and the organization, direction and staging of theatrical performances.

Literature-Language
The literature-language option is designed to prepare students for elementary and secondary school teaching. It is designed also to provide a sound basis for professional work in the principal fields of communications.
### CURRICULUM IN LANGUAGE ARTS

#### Freshman

<table>
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<td>Fundamentals of Journalism (Jour 101)</td>
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<td>Modern Theatre Practice (Dr 203)</td>
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#### Sophomore

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<td>History and Principles of Journalism (Jour 203)</td>
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<td>British Literature (Eng 209)</td>
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#### Junior

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<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Speech Composition (Sp 311)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Shakespeare (Eng 403)</td>
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<td>Undergraduate Seminar (Lang 463)</td>
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#### JOURNALISM OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

##### Sophomore

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<td>Jour 151 Practice Journalism</td>
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<td>Jour 205 Editing</td>
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<td>Jour 206 Techniques of Printing Production</td>
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<td>Jour 310 Editorial Writing</td>
<td>(2)</td>
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<td>Jour 311 Company Publications</td>
<td>(3)</td>
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<td>Jour 312 Publicity and News Bureau</td>
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##### Junior

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<tr>
<td>Jour 251 Advanced Journalism Practice</td>
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<td>Jour 304 Law of the Press</td>
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<td>Jour 308 Business and Labor Reporting</td>
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<td>Jour 309 Government, Courts and Law Reporting</td>
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<td>Jour 403 Community Newspaper Management</td>
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* To be taken from General Education list.

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14—14191
SPEECH OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Sophomore
Sp 102 Voice and Diction (3)
Dr 131 Technical Production I (3)
Sp 203 Oral Interpretation (3)
Dr 231 Acting Theory and Technique (3)
Sp 141 Laboratory in Voice and Diction Problems
or
Sp 230 Workshop in Forensics (1-2)

Junior
Sp 304 Argumentation (3)
Sp 307 Conference Techniques and Group Discussion (3)
Dr 334 Technique of Directing (3)

Senior
Sp 403 Speech Techniques in Society (3)
Psy 401 Social Psychology (3)
Sp 443 Advanced Projects in Oral Interpretation (1-3)
Sp 444 Advanced Projects in Forensics (1-3)

LITERATURE-LANGUAGE OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Sophomore
Eng 110 The Bible as Literature (3)
Eng 207-8 Survey of British Literature (6)
Eng 212-3 Survey of American Literature (6)

Junior
Eng 306 The Modern Novel (3)
Eng 308 The Modern Drama (3)

Eng 4 Preparatory English (3)
For the student who needs additional work in basic usage before he enters English 104. Frequent writing of short papers. Readings. 3 lectures.

Eng 104 Freshman Composition (3)
The fundamentals of English usage. Frequent writing of short papers, chiefly narrative. Readings. 3 lectures. Prerequisite: Satisfactory score in placement examination or Eng 4

Eng 105 Freshman Composition (3)
Frequent expository writing, with stress on organization. Technique of the term paper. Readings. 3 lectures. Prerequisite: Eng 104

Eng 106 Freshman Composition (3)
Frequent papers—narrative, expository, persuasive. Assignments in the mass media. 3 lectures. Prerequisite: Eng 105

Eng 107 Language Communication (3)
For Language Arts majors and other recommended students in place of Eng 106. Readings in contemporary fiction, drama, and poetry. 3 lectures. Prerequisite: Eng 105

Eng 110 The Bible as Literature (3)
Old and New Testament narrative, poetry, and wisdom literature in the Revised Standard Version. 3 lectures. Prerequisite: Eng 104

Eng 111 Western Literary Heritage (3)
Readings in classical, medieval, and Renaissance literature to the rise of science, with emphasis on the history of ideas. 3 lectures. Prerequisite: Eng 105
Eng 201 Introduction to Modern Fiction (3)
Readings chiefly in the twentieth-century short-story and novel, with emphasis on man's search for knowledge, self-understanding, and values. May not be elected by language arts majors. 3 lectures. Prerequisite: Eng 105

Eng 202 Introduction to Modern Drama (3)
Readings chiefly in twentieth-century drama, with emphasis on man's search for knowledge, self-understanding, and values. May not be elected by language arts majors. 3 lectures. Prerequisite: Eng 105

Eng 203 Introduction to Poetry (3)
Readings chiefly in modern poetry; some biographical and critical material. Emphasis on man's search for knowledge, self-understanding, and values. May not be elected by language arts majors. 3 lectures. Prerequisite: Eng 105

Eng 207, 208, 209 Survey of British Literature (3) (3) (3)
British literature, as exemplifying the history of ideas, from its beginning to the present, with emphasis on the major works. 3 lectures. Prerequisite: Eng 105

Eng 211, 212, 213 Survey of American Literature (3) (3) (3)
Philosophical, religious, political, and literary ideas in American writing from Colonial times to the present. 3 lectures. Prerequisite: Eng 111

Eng 216 Report Writing (3)
Report-writing techniques. Research, organization, and preparation of specialized and technical information. Regular written reports. 3 lectures. Prerequisite: Eng 105

Eng 218 Business Communication (3)
Business-writing techniques and forms. Emphasis on letters of application, inquiry, sales, credit, and customer relations. Oral reports and interviews. 3 lectures. Prerequisite: Eng 105

Eng 219 Technical Writing (2)
Principles and practices of technical writing. Preparation, organization, and communication of technical data; preparation of training materials. 2 lectures. Prerequisite: Eng 105

Eng 302 Advanced Composition—Fiction (3)
Analysis of the short-story form. Practice in applying the techniques of the short narrative. 3 lectures. Prerequisite: Eng 106 or 107

Eng 303 Advanced Composition—Non-fiction (3)
Study of current practices in written composition. Exercises in various types of exposition and magazine article writing. 3 lectures. Prerequisite: Eng 106 or 107

Eng 304 The Development of the Short-Story (3)
Critical analysis; history and evaluation of form. 3 lectures. Prerequisite: Eng 105

Eng 306 The Modern Novel (3)
Development of the novel since 1880, with emphasis on the novel in America and on the Continent. 3 lectures. Prerequisite: Eng 106 or 107

Eng 308 The Modern Drama (3)
Continental, British, and American dramatic trends from the rise of Naturalism. 3 lectures. Prerequisite: Eng 106 or 107

Eng 310 Modern British and American Poetry (3)
Advanced analysis of language and forms of poetry; application of poetic techniques in original works. 3 lectures. Prerequisite: Eng 106 or 107
### Eng 401 Chaucer (3)
Study of Chaucer's principal works, with special emphasis on *The Canterbury Tales* and *Troilus and Criseyde*. Consideration of historical influence and major contemporaries. 3 lectures. Prerequisite: Eng 106 or 107

### Eng 403 Shakespeare I (3)
Introduction to the major plays. 3 lectures. Prerequisite: Eng 106 or 107

### Eng 405 Literary Criticism (3)
Analysis of the works of selected major critics, with emphasis on the moderns. Application of principles in original critical essays. 3 lectures. Prerequisite: Eng 106 or 107

### Eng 406 Major American Writers (3)
Intensive reading in such writers as Hawthorne, Melville, Twain, and James. 3 lectures. Prerequisite: Eng 106 or 107

### Eng 409 The Grammars of English (3)
The various systems of describing the English language. Required of all prospective teachers. Not designed for those wishing to correct their deficiencies in usage. 3 lectures. Prerequisite: Eng 106 or 107

### Eng 427 Literature and Oral Interpretation for Young People (4)
Consideration of past and present works that might be adopted for the elementary and secondary curriculum to acquaint children and adolescents with standard writings as well as new literary productions. For elementary and secondary teacher-trainees. Two units to be devoted to interpretation and two units to literature. 3 lectures, 1 two-hour laboratory. Prerequisite: Eng 105

### Descriptions of Courses in Language Arts

#### Lang 461, 462 Senior Project (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems the graduate will meet in his chosen field of employment. Results presented in a formal written report. Minimum of 120 hours total time.

#### Lang 463 Undergraduate Seminar (2)
Reports of senior projects, discussions of professional articles of an appropriate level. 2 lecture-discussions. Prerequisite: Completion of senior project.

#### Lang 521 Curriculum and Methods in Language Arts (3)
Secondary school curriculum, methods, and materials in language-literature, speech-drama, and journalism. Separate classes in each sub-area if enrollments warrant. Includes school observation. 3 lecture-discussions. Prerequisite: Graduate standing and admission to teacher preparation program.

#### Lang 590 Seminar in Language Arts (1-3)
Topics in advanced areas of language, literature, speech, drama, or journalism according to the needs and interests of the students enrolled. Each seminar will have a sub-title according to the nature of its content. 1, 2, or 3 lecture-discussions. Prerequisite: Graduate standing and instructor's approval. May be repeated for a total of 9 units.

### Descriptions of Courses in Speech

#### Sp 102 Voice and Diction (3)
Physiology, mechanics, and function of the vocal mechanism; phonetics and enunciation; exercises and drills to improve the quality, flexibility, and effectiveness of the voice, leading to good usage of standard American speech. 3 lectures.

#### Sp 141 Laboratory in Voice and Diction Problems (1)
For students with special problems and those failing the teacher candidate screening examination. Correctional exercises and drills in such areas as voice placement, dialect, and enunciation. 1 laboratory.
Sp 200 Public Speaking (3)
Theory and practice in speech organization, composition, and delivery. 3 lectures. Prerequisite: Eng 105

Sp 203 Oral Interpretation (3)
Theory, methods, and practice in oral communication of literature, technical reports, criticism, and other written materials. Analysis of literary style as applied to oral communication. Exercises in microphone technique and public performance. 3 lectures.

Sp 230 Forensics Workshop (1-2)
Intercollegiate and intramural competition in debate, oratory, and oral interpretation. Independent projects in specialized fields. 1 or 2 laboratories. May be repeated for not more than 6 units.

Sp 300 Advanced Public Speaking (3)
Advanced techniques of public speaking as applied to business and professional speaking. Oral reports, panel and group discussions, speech analysis, persuasion and argumentation. Emphasis on perfection of individual styles. 3 lectures. Prerequisite: Sp 200

Sp 304 Argumentation (3)
Techniques of logic as applied to formal and impromptu debate. Obtaining and organization of evidence, construction of the written brief, analysis of fallacies, and rebuttal technique. Application of principles of argumentation to professional speaking. 3 lectures. Prerequisite: Sp 200

Sp 307 Conference Techniques and Group Discussion (3)
Theory and practice in forms of discussion such as panels, forums, and symposiums; business reporting and group dynamics; parliamentary procedure and formal discussion, brainstorming and other methods of investigative problem solving. 3 lectures. Prerequisite: Sp 200

Sp 311 Speech Composition (3)
Stylistic and organizational skills of public address, written speeches, speech vocabulary, organization, analysis of current public addresses, and speeches for special occasions. 3 lectures. Prerequisite: Sp 200

Sp 403 Speech Techniques in Society (3)
Analysis and performance of persuasive discourse; emotional appeals, propaganda techniques, and audience analysis; written reports on methods of advertisers and political speakers. Persuasive speaking in the democratic society. 3 lectures. Prerequisite: Sp 200

Sp 443 Advanced Projects in Oral Interpretation (1-3)
Planning, directing and producing programs, play and choral readings, and other special projects. 1 to 3 laboratories. May be repeated for not more than 6 units.

Sp 444 Advanced Projects in Forensics (1-3)
Participation and competition in upper division intercollegiate forensics, special projects for professional organizations, directing the high school forensics program and other independent projects in public address. 1 to 3 laboratories. May be repeated for not more than 6 units.

DESCRIPTIONS OF COURSES IN DRAMA

Dr 131 Technical Production I (3)
Principles of backstage organization, scenery construction, makeup, and property construction. Crew work on current productions. 1 lecture, 2 laboratories.
Dr 132 Technical Production II (3)
Principles and technique of stage lighting, elementary scene design, scenery painting, sound and costume. Crew work on current productions. 1 lecture, 2 laboratories.

Dr 203 Modern Theatre Practice (3)
Survey and analysis of theatre practice, including dramatic structure, financial organization, styles and forms of dramatic expression (including cinema and television), production methods, theory of acting and directing and interrelation of the components of theatrical expression. Practical exercises in application of theatre criteria. 3 lectures. Prerequisite: English 105 or permission of instructor.

Dr 231 Acting Theory and Technique (3)
Theory and practice of acting with special attention to body movement, pantomime, improvisation, characterization. 2 lectures, 1 laboratory.

Dr 244 Rehearsal and Performance (1-2)
Practical experience by participation in theatrical production. Technical crews, theatre management, and acting. 1 or 2 laboratories. May be repeated for not more than 6 units.

Dr 331 Advanced Acting (3)
Intensive study in styles and forms of acting, with special attention to mastery of technique and comparative study of theories of acting. 2 lectures, 1 laboratory. Prerequisite: Dr 231

Dr 332 Stage Lighting (3)
Theory and practice in stage lighting. Composition, design, switchboard design, instrument selection and purchasing, production planning. Students will serve as crew hands and supervisors for departmental productions. 2 lectures, 1 laboratory. Prerequisite: Dr 132

Dr 334 Technique of Directing (3)
Theory and practice in play selection, analysis and direction; emphasis on composition, movement, coaching, ground plans, style. 2 lectures, 1 laboratory. Prerequisite: Dr 231

Dr 335 Play Production (1-3)
Application of principles of play production and organization to practical theatre situations. Crew supervision, backstage organization and administration, publicity and box office operation, problems in sustained characterization in major roles, direction of short plays or sustained scenes. Emphasis on secondary school and community theatre problems. 1 to 3 laboratories. Prerequisite: Permission of instructor.

Dr 411 History of the Theatre (3)
Survey of dramatic art and production from the Greeks to the present. Application of historic principles and styles to contemporary play production and criticism. 3 lectures.

Dr 441 Advanced Projects in Theatre (1-3)
Advanced problems and independent projects in acting, directing, stage design, stage lighting, costuming and staging, including participation in major productions and independent production of experimental student plays. 1 to 3 laboratories. May be repeated for not more than 6 units.
DESCRIPTIONS OF COURSES IN JOURNALISM

Jour 101 Fundamentals of Journalism (3)
Introduction to basic news sources and documents; preliminary study of news writing techniques; journalism basics. 3 lectures. Prerequisite: Satisfactory score on placement examination or Eng 4

Jour 131 Elementary Photography (3)
Basic photography techniques, including taking, processing, and selecting good photos. For those who have had no or very limited experience in photography. 1 lecture, 2 laboratories.

Jour 151 Practice Journalism (1-2)
Laboratory course for beginning staff members of college publications and student news bureau. 1 or 2 laboratories. Prerequisite: Permission of the instructor and satisfactory score in placement examination or Eng 4. Total credit limited to 6 units.

Jour 202 Reporting (3)
Covering and writing the news story; study of journalistic style. 3 lectures. Prerequisite: Jour 101

Jour 203 History and Principles of Journalism (3)
History, background, and responsibilities of the mass mediums in the progress of man. Special emphasis on development of journalism in the United States. 3 lectures.

Jour 205 Editing (3)
Copy editing, headline writing, layout, and makeup. 3 lectures. Prerequisite: Jour 101

Jour 206 Techniques of Printing Production (3)
Printing processes and the adaptability and possibilities of each; preparation of material for printing. 3 lectures.

Jour 212 Public Relations (3)
The effects of organized information upon public thinking. Dissemination of ideas by commercial, industrial, social, and governmental organizations. Term project. 3 lectures. Prerequisite: Eng 105

Jour 231 Advanced Photography (3)
Advanced work in photographic techniques, including color photography and portrait work. 1 lecture, 2 laboratories. Prerequisite: Jour 131 or demonstrated knowledge of basic photography.

Jour 251 Advanced Journalism Practice (1-2)
Laboratory course for experienced staff members of college publications or student news bureau. 1 or 2 laboratories. Prerequisite: Permission of the instructor. Total credit limited to 6 units.

Jour 304 Law of the Press (3)
The fundamentals and applications of libel and right-of-privacy laws as they affect the mass mediums. 3 lectures. Prerequisite: Jour 203

Jour 306 Sports Reporting (2)
Gathering material for and writing sports stories. 2 lectures. Prerequisite: Jour 202

Jour 307 Specialized Reporting (2)
Study and training in gathering and writing specialized stories such as entertainment, books, travel, home, and food. 2 lectures. Prerequisite: Jour 202

Jour 308 Business and Labor Reporting (2)
Gathering material for and writing stories pertaining to labor, business, and industry. 2 lectures. Prerequisite: Jour 202
Jour 309  Government, Courts, and Law Reporting  (2)
Study and training in gathering and writing stories pertaining to government and courts; special emphasis on organization and court procedure. 2 lectures. Prerequisite: Jour 202

Jour 310  Editorial Writing  (2)
Writing editorials; emphasis on the use of editorial comment. 2 lectures. Prerequisite: Jour 202

Jour 311  Company Publications  (3)
The use of printed material in business and industry, including house organs, brochures, and pamphlets; writing and production of these publications. 3 lectures. Prerequisite: Jour 206 and 212

Jour 312  Publicity and News Bureau Operations  (3)
The use of publicity in business, industry, and government; preparation of the news release; organization and operations of the news bureau. 3 lectures. Prerequisite: Jour 202

Jour 351  Editorial Practice  (1-2)
Laboratory course for students holding editorial or equivalent positions on college publications or student news bureau. 1 or 2 laboratories. Prerequisite: Permission of instructor. Total credit limited to 6 units.

Jour 401  Ethics  (3)
A study of the responsibility of the mass mediums and the journalist in today's society. 3 lectures. Prerequisite: Jour 304

Jour 403  Community Newspaper Management  (3)
The organization of the community newspaper, including study of advertising and circulation problems and relations with the community. 3 lectures. Prerequisite: Jour 101

DESCRIPTION OF COURSE IN SPANISH
Span 221, 222, 223  Conversational Spanish  (3) (3) (3)
Oral drill and conversational practice. Class drill in pronunciation, sentence structure, vocabulary, and basic conversation in relation to Latin-American usage. Listening and responding to recorded materials. 2 lectures, 1 two-hour laboratory.
The curriculum in marketing is designed to prepare students for positions in that portion of the business field which concerns itself with bringing to users the products of either agriculture or industry. It covers the fields of retail, wholesale, and industrial selling, and provides preparation for such positions as that of salesman, store operator, sales manager, advertising manager, advertising agency executive, and research director. Required courses cover not only those subjects dealing directly with marketing, but also many others involving the structure and organization of business as a whole, so that graduates will have an adequate grasp of the overall problems of an organization, and will be equipped to make their marketing activities an important part of the complete operation.

Courses and the curriculum have been built so as to provide the opportunity for actual work experience as well as theory. Instructors are selected on the basis of their marketing experience, knowledge of theory, and educational backgrounds.

**CURRICULUM IN MARKETING**

**Freshman**

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<td>Principles of Accounting (Acc 121, 122, 123)</td>
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<td>Management Principles (Bus 101)</td>
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**Sophomore**

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<td>Principles of Economics (Ec 201, 202)</td>
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* To be selected from the General Education list.
### Junior Courses

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<th>Course</th>
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<tbody>
<tr>
<td>Business Law (Bus 301, 302)</td>
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<tr>
<td>Sales Management (Mktg 301)</td>
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<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Business Forecasting (Bus 311, 312)</td>
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<tr>
<td>Advanced Public Speaking (Sp 300)</td>
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<td>Business Finance (Fin 314)</td>
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<td>Insurance Principles (Fin 303)</td>
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<td>Industrial Marketing (Mktg 302)</td>
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<tr>
<td>Human Relations (Psy 304)</td>
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<tr>
<td>Business and Government (Ec 302)</td>
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<td>Retail Store Management (Mktg 303)</td>
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### Senior Courses

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<td>Traffic Management (Mktg 304)</td>
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<tr>
<td>Credit Management (Fin 301)</td>
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<tr>
<td>Market Analysis and Research (Mktg 401)</td>
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<tr>
<td>Senior Project (Mktg 461, 462)</td>
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<tr>
<td>Interpretation of Research Data (Mktg 402)</td>
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<tr>
<td>Undergraduate Seminar (Mktg 463)</td>
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<tr>
<td>*Literature, Philosophy, Fine &amp; Practical Arts</td>
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<tr>
<td>Marketing Management (Mktg 403)</td>
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<tr>
<td>Electives</td>
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<td>16</td>
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</table>

### Descriptions of Courses in Marketing

**Mktg 201, 202 Marketing Principles (3) (3)**
A survey of the problems concerned with the marketing of goods and services with emphasis on sound principles and practices. 3 lectures.

**Mktg 204 Advertising Principles (3)**
Technical, economic, and professional aspects of advertising. Campaign organization for effective advertising. 3 lectures.

**Mktg 205 Advertising Practices (3)**
Considerations involved in production and placing of advertising. Copy, layout, production and reproduction processes, media selection and research. 3 lectures. Prerequisite: Mktg 204

**Mktg 206 Sales Promotion (3)**
Methods of marketing merchandise, channels of distribution, co-ordination of sales and advertising effort, special inducements, and point-of-purchase displays. 3 lectures. Prerequisite: Mktg 204

**Mktg 208 Salesmanship (3)**
Salesmanship and the role of the salesman in retail and wholesale selling. Sales techniques, Salesmanship and product service. Solutions to sales problems. 3 lectures. (Credit will not be allowed for both ABM 202 and Mktg 208)

**Mktg 301 Sales Management (3)**
Organization and operation of sales forces. Determination of market potentials. Methods of remuneration. 3 lectures. Prerequisite: Mktg 202

*To be selected from General Education list. At least one course will be in literature.
Mktg 302 Industrial Marketing (3)
Marketing of products for resale or further manufacture. 3 lectures. Prerequisite: Mktg 202

Mktg 303 Retail Store Management (3)
Problems of merchandising, location, layout, display, advertising, records, purchasing, personnel relations, and other considerations of retail operations. 3 lectures. Prerequisite: Mktg. 202

Mktg 304 Traffic Management (3)
Purchase and sale of transportation. Rate structures and controls. Rate claims and Interstate Commerce Commission proceedings. Study of uses of bills of lading and claims. Storage locations, and routing considerations. 3 lectures.

Mktg 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigation of special areas in the field of marketing. Total credit limited to four units with not more than two units in any one quarter. Prerequisite: Senior standing and consent of instructor.

Mktg 401 Market Analysis and Research (3)
Determination of market potentials, sales areas and sales quotas. Sources of market data. Techniques of quantitative and qualitative market analysis. 3 lectures. Prerequisite: Mktg 301

Mktg 402 Interpretation of Business Data (3)
Sources and types of data, their significance and application to forecasting. 3 lectures. Prerequisite: Mktg 401

Mktg 403 Marketing Management (3)
Analysis of problems confronting the marketing executive and the development of decision-making techniques used in solving them. 3 lectures. Prerequisite: Senior standing or permission of instructor.

Mktg 441, 442 Internship in Marketing (2) (2)
On-the-job training with a business in some phase of marketing, selling, or advertising. The experience must be new to the student so that learning takes place. Analytical reports of work accomplished by each student are made periodically to the faculty co-ordinator. Prerequisite: Permission of instructor.

Mktg 461, 462 Senior Project (2) (2)
Seminar dealing with current problems in the functional areas of business. Completion of a paper required. Students may work in a project under a minimum of supervision relating to one of these areas in lieu of seminar. Minimum of 120 hours required. Prerequisite: Senior standing or special permission of instructor.

Mktg 463 Undergraduate Seminar (2)
Study and discussion by students of recent developments in the students' major field. Two meetings. Prerequisite: Senior standing or special permission.
The Mathematics Department offers courses needed in the agricultural and engineering divisions for the purpose of developing vocational proficiency and courses designed to contribute to the general education of all students.

Placement tests are given to entering students to determine their facility and preparation in mathematics. The results of these tests are used to help in placing the new student in courses where he will most likely succeed. Students in engineering will normally begin their college work in mathematics with Math 117. Students in agriculture and in arts and sciences will normally begin with Math 101.

The major in mathematics is planned with two objectives. First, it is intended to prepare secondary school teachers of mathematics who are aware of the significance of mathematics and of its contributions to modern living. Its second objective is to prepare mathematicians for industrial and civil service employment. The major program requires extensive work in applied mathematics and skills courses with a view to producing mathematicians who are capable of using their knowledge in a wide variety of applications. A high school student planning a major in mathematics should take three semesters of algebra, one of trigonometry, two of geometry, two of physics, and two of chemistry.

**CURRICULUM IN MATHEMATICS**

**Freshman**

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Freshman Composition (Eng 104, 105, 106)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>College Algebra and Trigonometry (Math 117)</td>
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<tr>
<td>* Biological Science</td>
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<tr>
<td>General Physics (Phys 131)</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 118, 201)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<td>General Chemistry (Chem 321, 322)</td>
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<td>Symbolic Logic and Set Theory (Phil 205)</td>
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Total: 16½

**Sophomore**

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<td>Physical Education (PE 141)</td>
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<td>General Physics (Phys 132, 133 or 204)</td>
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<td>Principles of Economics (Ec 201, 202)</td>
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<td>* Literature</td>
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<tr>
<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Economics</td>
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<tr>
<td>Differential Equations (Math 316)</td>
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Total: 16½

* To be selected from the General Education list.
## Arts and Sciences Division

**Junior**

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<th>Course Description</th>
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<tr>
<td>American Civilization (Am Civ 301, 302, 303)</td>
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<td>Differential Equations (Math 317)</td>
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<td>Theory of Equations (Math 307)</td>
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<tr>
<td>Mathematical Analysis of Engineering Problems (Math 319)</td>
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<td>Senior Project (Math 461)</td>
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<tr>
<td>Statistics (Math 309 or 311)</td>
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**Senior**

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<th>Course Description</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>Senior Project (Math 462)</td>
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<tr>
<td>Undergraduate Seminar (Math 463)</td>
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### DESCRIPTIONS OF COURSES IN MATHEMATICS

**Math 1 Preparatory Mathematics (3)**

Fundamentals of arithmetic, denominate numbers, introduction to algebra, percentage, exponents, simultaneous linear equations. Required of all students who show a deficiency in algebra on the placement examination. 3 lectures.

**Math 7 Preparatory Algebra (5)**

Signed numbers, linear equations, literal equations, formula evaluation, functional relationships, graphing linear and quadratic equations, factoring algebraic functions, fractional equations. 5 lectures.

**Math 101 Basic Mathematics (3)**

Graphs, charts, ratio, proportion, variation, basic algebraic operations, linear and quadratic equations, logarithms. 3 lectures. Prerequisite: Satisfactory score on mathematics placement examination or Math 1.

**Math 106 Business Mathematics (3)**

Simple interest, discounts, compound interest, annuities, sinking funds, amortization, insurance, stocks and bonds. 3 lectures. Prerequisite: Math 101.

**Math 112 Basic Mathematics for General Education (3)**

Elements of trigonometry, analytic geometry, and statistics as applied to biological sciences, physical education, social sciences. 3 lectures. Prerequisite: Math 101.

**Math 117 College Algebra and Trigonometry (5)**

A unified treatment of the basic principles of college algebra and trigonometry. 5 lectures. Prerequisite: Math 7 or satisfactory score on placement examination.

**Math 118 Analytic Geometry and Calculus (5)**

Introduction to analytic geometry and calculus. 5 lectures. Prerequisite: Math 117.

**Math 201, 202, 203 Analytic Geometry and Calculus (3) (3) (3)**

Continuation of analytic geometry and calculus. 3 lectures. Prerequisite: Math 118.

**Math 205, 206, 207 Basic Concepts of Elementary Mathematics (3) (3) (3)**

Historical development of systems of numeration, the evolution of the number concept, the logical basis of the number system, fundamental operations, mensuration, measurement, functions and graphs. Selected topics in algebra and geometry. 3 lectures. Prerequisite: Satisfactory score on placement examination of Math 1.
Math 211 Descriptive Statistics (3)
Graphical representation of statistical data; calculation and uses of various averages, measures of variability, elementary probability and the normal probability curve, simple linear correlation. 3 lectures. Prerequisite: Math 101, 117 or 207

Math 217 Mathematics of Digital Computers I (3)
Boolean algebras and number systems with particular reference to the calculus of binary numbers. 3 lectures. Prerequisite: Math 118

Math 218 Mathematics of Digital Computers II (3)
Logical design of digital computers including arithmetic operations, typical memory devices, input and output units. 3 lectures. Prerequisite: Math 217

Math 221 Automatic Programming for Digital Computers (1)
Solution of scientific and engineering problems using automatic programming for a general purpose computer. Special emphasis will be on formula translation through the use of the Fortran compiler. 1 lecture. Prerequisite: Math 112 or concurrent enrollment in Math 117

Math 304 Programming of Digital Computers (3)
Coding of general purpose and special purpose digital computers. Preparation of programs of general purpose computers. Sub-routines. 3 lectures. Prerequisite: Math 217

Math 307 Introduction to Theory of Equations (3)
Complex numbers, general theorems on algebraic equations, solution of the general cubic, methods of solution of algebraic equations. 3 lectures. Prerequisite: Math 201

Math 309 Statistical Methods in Engineering and the Physical Sciences (3)
Use of statistical methods in experimentation, testing, inspection and production. Measurement errors, comparison of two or more means; comparison of two or more variances; correlation; design of engineering experiments. 3 lectures. Prerequisite: Math 202

Math 311 Mathematical Statistics I (3)
Probability, distributions for discrete and for continuous variates, expected values and moments, sampling distributions, point estimation. 3 lectures. Prerequisite: Math 203

Math 312 Linear Systems and Matrices (3)

Math 316 Differential Equations (3)
An introduction to first order differential equations and simple linear equations with constant coefficients. Applications to dynamics, electric circuits, and heat flow. 3 lectures. Prerequisite: Math 203

Math 317 Differential Equations (3)
Introduction to Fourier Series and Integrals with applications. Elementary theory of Laplace transformation with applications including the solution of differential equations. 3 lectures. Prerequisite: Math 316

Math 318 Mathematical Analysis of Engineering Problems (3)
Introduction to the algebra and calculus of vectors including the divergence and Stoke's theorem. Introduction to analytic functions of a complex variable. 3 lectures. Prerequisite: Math 316
Math 319  Mathematical Analysis of Engineering Problems  (3)
    Introduction to the solution of partial differential equations, Fourier integral. 3 lectures. Prerequisite: Math 317

Math 322  Mathematical Statistics II  (3)
    Maximum likelihood estimators, interval estimation, tests of hypotheses, linear regression, analysis of variance and distribution free methods. 2 lectures, 1 activity period. Prerequisite: Math 311

Math 332  Numerical Methods in Analysis  (3)
    Numerical solution of algebraic and transcendental equations and systems of equations, finite differences, interpolation, numerical integration, and numerical solution of ordinary differential equations. 3 lectures. Prerequisite: Math 316

Math 400  Topics in Applied Mathematics  (1-2)
    Individual or group investigations of selected topics in applied mathematics. Total credit limited to 4 units. 1 or 2 lecture-discussions. Prerequisite: Permission of instructor.

Math 404  Vector Analysis  (2)
    Algebra of free vectors with applications. Introduction to differential and integral calculus of vectors. 2 lectures. Prerequisite: Math 316

Math 405  Vector Analysis  (2)
    Calculus of scalar and vector functions. Derivation and properties of gradient, divergence, and curl. Applications of analytic vector methods to problems of physics and engineering. 2 lectures. Prerequisite: Math 404

Math 408, 409 Functions of a Complex Variable  (2) (2)
    Fundamental properties of a complex variable. Integration in the complex plane, power series, contour integration, conformal mapping with applications. 2 lectures. Prerequisite: Math 316

Math 410  Introduction to Modern Algebra  (3)
    An introduction to abstract algebra, structure of number systems, groups, rings, integral domains and fields. 3 lectures. Prerequisite: Math 203

Math 411  Foundations of Geometry  (3)
    Selected topics in synthetic and projective geometry; Euclidian and non-Euclidian geometry. 3 lectures. Prerequisite: Math 203

Math 412, 413, 414 Advanced Calculus  (3) (3) (3)
    Sequences, limits, infinite series, convergence, continuity, derivatives and differentials, partial derivatives. Riemann integration, fundamental theorem of integral calculus, approximate integration, improper integrals, multiple integrals, applications to analysis. 3 lectures. Prerequisite: Math 203

Math 432  Numerical Methods in Analysis  (3)
    Expansion and continuation of Math 332. Interpolation and numerical differentiation and integration of formulas of Lagrange, Gauss, Bessel, and Stirling. Numerical solution of ordinary, difference and partial differential equations. 2 lectures, 1 activity period. Prerequisite: Math 332

Math 461, 462 Senior Project  (2) (2)
    Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum of 120 hours total time.

Math 463  Undergraduate Seminar  (2)
    Discussions through seminar methods of new developments in the fields of student's particular interests. 2 lecture-discussions.
Math 521  Curriculum and Methods in Mathematics  (3)

Modern tendencies and general aims of secondary school mathematics. Objectives of and methods for effective teaching in general mathematics, algebra, geometry, and trigonometry. 3 lectures. Prerequisite: Admission to teacher education program and graduate standing.

Math 590  Seminar in Mathematics  (1-3)

Topics in advanced mathematics chosen according to the interests and needs of the students enrolled. Each seminar will have a sub-title according to the nature of the content. 1, 2, or 3 lectures. Prerequisite: Instructor's approval and graduate standing. May be repeated for a maximum of 6 units.
Courses in the Music and Art Department are designed to give all artistically inclined students the opportunity to participate in college musical organizations, to further their proficiency in singing and in playing instruments, and to provide instruction in art and audio-visual techniques.

Students interested in music are given a broad insight into the general field of music through courses in basic skills, theory, appreciation, and history. Students must have had some previous experience with a musical instrument in order to try out for band or orchestra. While previous experience in choral music is helpful, it is not mandatory.

Courses in art are provided for teacher preparation and to provide all students an opportunity to develop their talents and aesthetic appreciation.

Audio-visual courses provide a cultural background for all students and furnish many kinds of skills and techniques necessary to success in teaching, advertising, sales, and other professional activities.

**DESCRIPTIONS OF COURSES IN MUSIC**

**Mu 101 Music Theory (3)**
Elements of music theory; construction of major and minor scales; intervals, rhythms, sight-singing, musical terms, syllable work. 3 lectures.

**Mu 111, 112, 113 Class Piano (1) (1) (1)**
Beginning class piano instruction. Development of ability to play simple chords in all keys and to harmonize simple melodies using these chords. Transposition of simple melodies. Technical studies. 1 activity period.

**Mu 141 Stage Orchestra (1-2)**
Limited to those students with considerable experience playing musical instruments. Involves participation in annual road show tour. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 147 Brass, String or Woodwind Choir (1)**
Open to qualified players. Rehearsal and public performance in small ensembles. 1 activity period. Total credit limited to 12 units.

**Mu 151 Band (1)**
The band serves a dual purpose: for athletic events and for concerts. Membership open to all students. 1 activity period. Total credit limited to 12 units.

**Mu 154 Men's Glee Club (1-2)**
Choral vocal training, study and performance of concert literature. Membership open to all men students. Quartets and soloists selected from this group. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 157 Women's Glee Club (1-2)**
Choral vocal training, study and performance of concert literature. Membership open to all women students. Small groups and soloists selected from this group. 1 or 2 activity periods. Total credit limited to 24 units.

**Mu 161 A Cappella Choir (1-2)**
A cappella singing for both men and women. Standard choir repertory. Formal concerts presented each school year. 1 or 2 activity periods. Total credit limited to 12 units.
Mu 201 Basic Music Skills (3)
Introduction of music skills basic to the comfortable participation in any music activity. Subject matter includes singing, elementary theory, playing keyboard and chording instruments, listening, and creating music. 3 lectures.

Mu 202 Musicianship (3)
A continuation of music theory, but with emphasis on application of fundamentals learned. Drill in harmonic, melodic, and rhythmic dictation. 3 lectures. Prerequisite: Mu 101

Mu 203 Elementary Harmony (3)
Analysis and writing of four-part harmony. 3 lectures. Prerequisite: Mu 202

Mu 204, 205, 206 Music Appreciation (2) (2) (2)
Appreciation of the physical and aesthetic aspects of music developed through acquainting the student with the better known schools and composers of past and present, the forms of musical composition and the instruments and choirs of music ensembles. Lectures, recording, and demonstration. 2 lectures.

Mu 211, 212, 213 Class Piano II (1) (1) (1)
Second year of class piano. Continued development of music reading skills, playing by ear and transposing; emphasis on music for recreational uses in the home, church, and community. 1 activity period. Prerequisite: Mu 113

Mu 231 Instrumental Instruction (1)
Fundamentals of playing and teaching brass, woodwind, string, and percussion instruments. Appropriate sections arranged with instructor. 1 activity period. May be repeated for a total of 3 units.

Mu 237 Class Voice (1)
Fundamental techniques of singing. Problems of tone production, breathing, diction, repertoire, and song interpretations. 1 activity period. May be repeated for a total of 3 units.

Mu 307 Conducting (2)
Elements of baton technique and development of basic skills in conducting with instrumental and vocal groups. 2 lectures. May be repeated for a maximum of 6 units.

Mu 431 Advanced Instrument Instruction (1)
Class instruction in technique and repertoire for advanced students of orchestral and band instruments. 1 activity period. Prerequisite: consent of instructor. May be repeated for a total of 3 units.

Mu 436 Music Literature for Children (3)
Music literature especially suited for (but not limited to) children. Instrumental, vocal, and piano music recordings are played, studied, and evaluated. Songs for children played and sung by teacher and students. 3 lectures.

Mu 437 Advanced Voice (1)
Class instruction in advanced techniques and materials. 1 activity period. Prerequisite: consent of instructor. May be repeated for a total of 3 units.

Mu 441 Basic Instruments (1)
Class instruction in brass, woodwind, string, and percussion to give the student a proficiency in playing instruments in each of the instrumental choirs. 1 activity period. May be repeated for a total of 4 units, each in a different choir.
DESCRIPTIONS OF COURSES IN ART

Art 110 The Visual Arts (3)
Appreciation and understanding of the visual arts. A comprehensive survey of the relationships within the arts as well as their respective and collective relationship to the structure of society. 3 lectures.

Art 234 Art Materials and Skills (3)
Development of appreciative and creative skills. Materials involved in elementary expression in art media, emphasizing drawing and graphic work. Selecting, organizing, guiding, and evaluating individual and group activities. 2 lectures, 1 laboratory.

Art 235 Craft Materials and Skills (3)
Basic projects with various craft materials. Ceramics, metal, textiles, wood, and leather. Development of three-dimensional skills and concepts through the materials, and their properties. Evaluative criteria applied to craft materials. 2 lectures, 1 laboratory.

Art 241 Graphic Design (2)
Methods and techniques of graphic design in two-dimensional media. Projects in layout, design, lettering. 2 two-hour laboratories.

Art 244 Fundamentals of Drawing (1-2)
Analysis and practice in functional drawing, basic design, and study of form. Development of individual techniques. Pursuit of individual projects to suit abilities and interests of students. 1 or 2 two-hour laboratories. May be repeated for a total of 3 units.

Art 249 Watercolor Painting (2)
Methods and techniques with watercolor. Outdoor sketching and studio projects. 2 two-hour laboratories.

Art 312 Foundations of Modern Art (3)
Analysis of the foundations of the visual arts in modern life, equating the development of contemporary forms with those of other cultural forces. 3 lectures.

Art 345 Intermediate Drawing (1-2)
The development of method and technique in figurative and perspective drawing. Emphasis on the individual solution of problems in compositions. 1 or 2 two-hour laboratories. Prerequisite: Art 244. May be repeated for a total of 3 units.

Art 439 Advanced Watercolor Painting (3)
Group and individual projects requiring solution in terms of established art principles and applied art theory. Traditional and experimental approach with the emphasis on individual development. 3 two-hour laboratories. Prerequisite: Art 234, 345 and permission of instructor.

Art 446 Advanced Drawing (1-2)
Development of individual concepts and styles through projects involving experimental and traditional drawing methods and media. 1 or 2 two-hour laboratories. Prerequisite: Art 345. May be repeated for a total of 3 units.

DESCRIPTIONS OF COURSES IN AUDIO-VISUAL TECHNIQUES

AV 400 Special Problems in Audio-visual Production (1-2)
Experience in production of models, mockups, and other audio-visual devices in the student's field. Total credit limited to 8 units, with not more than 2 units in any quarter. 1 or 2 laboratories. Prerequisite: AV 431 or consent of instructor.

AV 431 Audio-visual Materials and Methods (3)
Visual and auditory methods and materials of value in classroom teaching in elementary and secondary schools. Discussion, previewing, planning, and correlating use of audio-visual techniques and materials in the classroom. 2 lectures, 1 laboratory. Prerequisite: Psy 312 or permission of instructor.
AV 432  Audio-visual Methods in Business and Industry  (3)
Industrial and business uses of visual and auditory materials in planning training aids, mass communication, materials, demonstrations, mockups, models, and conferences. Planning, previewing, and skill development for business and industry. 2 lectures, 1 laboratory. Prerequisite: Psy 304 or permission of instructor.

AV 440  Educational Television Production Workshop  (3)
Theory and practice of educational television with emphasis on practical experience in the various aspects of production; planning, writing, graphics, directing, and studio operations. 1 lecture, 2 two-hour laboratories. Prerequisite: AV 400, 431, or consent of instructor. May be repeated for a total of 9 units.

AV 441  Automated Instructional Procedures  (3)
Automated instructional materials. Theory of programmed learning, current applications, and the state of the art. Laboratory experiences include evaluation and testing of existing programs and machines, construction of sample materials by the student. 1 lecture, 2 two-hour laboratories.
PHYSICAL EDUCATION DEPARTMENT
Department Head, V. Barney Anooshian

Kenneth H. Cochrane  Dorothy L. Kiefer  Magnus Syverson
Raymond C. Daugherty  Alfred I. Miller  Jessie I. Totten
Donald L. Haldeman  John H. Scolinos  Donald E. Warhurst
Leon S. Jackson  Robert B. Stull

The primary function of the Physical Education Department is to provide both required and elective courses in physical education and health to meet the general education needs of all students. To supplement this general education, the department provides an intramural sports program for the students of the college and makes opportunities available for participation in intercollegiate athletics.

Another function of the department is to prepare both men and women as secondary teachers in the fields of physical education, health, safety education, and driver training. By proper selection of elective courses, the student can prepare for work in recreation and in social work. Facilities include a gymnasium, swimming pools, outdoor basketball, tennis, and volleyball courts and turfed area for football, baseball, track and field.

CURRICULAR OPTIONS

Physical Education
This option emphasizes those skills and knowledges required for the Standard Teaching Credential with Secondary Specialization including undergraduate work in professional preparation.

Recreation
Emphasis is placed upon skills required for employment in public, industrial, and commercial recreational programs.

CURRICULUM IN PHYSICAL EDUCATION

Freshman

<table>
<thead>
<tr>
<th>Course</th>
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<td>Freshman Composition (Eng 104, 105, 106)</td>
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<tr>
<td>Mathematics (Math 101)</td>
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<tr>
<td>Health Education (PE 107)</td>
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<tr>
<td>Safety and First Aid (PE 121)</td>
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<tr>
<td>Physical Education (PE 141)</td>
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<tr>
<td>Orientation to Physical Education (PE 157)</td>
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<tr>
<td>Introduction to Recreation (PE 126)</td>
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<tr>
<td>Swimming and Water Sports Theory and Practice (PE 123)</td>
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<tr>
<td>Basic Biology (Bio 115, 145)</td>
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<tr>
<td>General Physical Science (PSc 101, 102, 103) or equivalent</td>
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<tr>
<td>Electives and courses to complete major</td>
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Sophomore

*Literature, Philosophy, Art or Music*                                    3 3 3
*Principles of Economics (Ec 201, 202)*                                   3 3 3
*Principles of Physical Education (PE 201)*                              3
*Apparatus and Gymnastics (PE 225)*                                      2
*Public Speaking (Sp 200)*                                                3
*Human Anatomy and Physiology (Zoo 234, 235)*                            4 4 3
*Physical Education (PE 141)*                                            ½ ½ ½
*General Psychology (Psy 202)*                                           4 3 6
Electives and courses to complete major                                   5 4 6

**17 ½**  **16 ½**  **16 ½**

*To be selected from the General Education list. At least one course will be in literature.*
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<tr>
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<tbody>
<tr>
<td>Math 112 Basic Mathematics for General Education</td>
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<tr>
<td>PE 232 Intramural Sports</td>
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<tr>
<td>PE 203 School &amp; Community Health</td>
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<tr>
<th>Junior</th>
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<tr>
<td>PE 327 Elementary School Physical Education</td>
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<tr>
<td>Psy 306 Adolescent Psychology</td>
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<td>Psy 312 Educational Psychology</td>
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<td>Ed 301 Principles of Education</td>
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<tr>
<th>Senior</th>
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<tr>
<td>PE 401 Organization &amp; Administration of Physical Education</td>
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<tr>
<td>PE 403 Curriculum &amp; Methods of Physical Education</td>
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<tr>
<td>PE 405 School Health Administration</td>
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<tr>
<td>PE 425 Tests &amp; Measurement in Physical Education</td>
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**PHYSICAL EDUCATION OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)**

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<tr>
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<tr>
<td>PE 224 Administration of Recreation</td>
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<tr>
<td>PE 232 Intramural Sports</td>
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<tr>
<td>PE 245 Advanced Swimming and Water Safety</td>
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<tr>
<td>PE 222 Recreational Games</td>
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<tr>
<td>PE 300 Safety Education</td>
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<tr>
<td>PE 316 Social &amp; Outdoor Education</td>
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<tr>
<td>Soc 201-2 Principles of Sociology</td>
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**RECREATION OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)**

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<td>PE 232 Intramural Sports</td>
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<tr>
<td>PE 245 Advanced Swimming and Water Safety</td>
<td>(2)</td>
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<tr>
<td>PE 222 Recreational Games</td>
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<tbody>
<tr>
<td>PE 300 Safety Education</td>
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</tr>
<tr>
<td>PE 316 Social &amp; Outdoor Education</td>
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**Alternative Requirements for Men and Women majors.**
DESCRIPTIONS OF COURSES IN PHYSICAL EDUCATION

PE 107 Health Education (2)
Personal hygiene and health education; investigation of the principles which promote attitudes and practices for optimum physical and mental health. Fire prevention and public safety; alcohol and other drugs. 2 lectures.

PE 121 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 123 Swimming and Water Sports Theory and Practice (2)
Supervision of pool activities. Swimming instruction and safety. Teaching and coaching swimming and water polo. 1 lecture, 1 two-hour laboratory. Prerequisite: Demonstrated swimming ability.

PE 126 Introduction to Recreation (3)
Games and activities suitable for a community recreation program. 1 lecture, 2 two-hour laboratories.

PE 141 Physical Education (½)
Enrollment in activity classes limited as follows:
Men only: Physical Fitness (prerequisite to all activities), apparatus and tumbling, basketball, physical fitness, flag football, handball, soccer, softball, track and field, volleyball, wrestling.
Women only: fundamentals of movement (prerequisite to all activities), modern dance, field hockey, softball basketball.
Coeducational: archery, badminton, dance, golf, swimming, tennis, fencing, volleyball. 2 activity periods. Total credit limited to 3 units.

PE 144 Beginning Swimming (½)
Beginning swimming for all who do not pass college swimming test. 2 activity periods. Total credit limited to 1 unit.

PE 147 Adaptive Activities (½)
Group and individual exercise based upon individual needs in posture, body mechanics, nutrition, post injury and illness, and cardiac cases. Course taken in lieu of PE 141 upon recommendation of college physician. 2 activity periods. Total credit limited to 3 units.

PE 151 Competitive Athletics (1)
May be substituted for required physical training by those qualified to compete in intercollegiate sports program. 10 hours activity. Total credit limited to 6 units.

PE 154 Dance Production (1)
Intermediate and advanced dance technique with an emphasis on composition and production in the area of dance, free exercise, gymnastics, etc. May be substituted for PE 141 by students talented in exhibition activities. 10 hours activity. Total credit limited to 6 units.

PE 157 Orientation to Physical Education Profession (2)
Orientation and guidance of major and minor students in physical education. Must be taken during the first quarter of enrollment as a physical education major or minor. 2 two-hour laboratories.

PE 201 Principles of Physical Education (3)
History and concept of physical education and recreation as a profession. Correlation between principles and methods. 3 lectures.
PE 203 School and Community Health Education (2)
School health programs and their inter-relationship to community health agencies; underlying principles; legal aspects; administrative divisions of health instruction, health services and healthful school living. 2 lectures.

PE 221 Wrestling Theory and Practice (2)
Critical analysis of the methods and problems in teaching and coaching wrestling. Lesson planning, development of teaching units, organization for class activity and administration of the program. 1 lecture, 1 two-hour laboratory.

PE 222 Recreational Games (2)
Development of a repertoire of group and individual quiet games for use by people confined to small areas. 1 lecture, 1 two-hour laboratory.

PE 224 Administration of Recreation (3)
Supervision and administration of recreation with consideration of facilities, budget, equipment maintenance, public relations, and special activities. 2 lectures, 1 two-hour laboratory.

PE 225 Apparatus and Gymnastics (2)
Critical analysis of methods and problems in teaching and coaching apparatus, gymnastics, and tumbling in the secondary teaching situation. Lesson planning, development of teaching units, organization for class activity, and administration of the program. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 141, apparatus and tumbling.

PE 232 Intramural Sports (3)
Principles and policies underlying programs of intramural sports in secondary schools and community centers. 2 lectures, 1 two-hour laboratory.

PE 245 Advanced Swimming and Lifesaving (2)
Lifesaving techniques. The Senior Red Cross Life Saving and the Water Safety Instructor's certificates will be issued to those students who satisfactorily complete the course. 1 lecture, 1 two-hour laboratory.

PE 300 Safety Education (3)
Principles and practices of safety as applied to home, fire, industrial, school, community, and traffic situations. Accident prevention. 3 lectures.

PE 301 Introduction to Special Services in Recreation (3)
Orientation to field of hospital recreation, employee's recreation, commercial recreation, and industrial recreation. 3 lectures.

PE 302 Kinesiology (3)
Interrelationships of the body segments and the action of the joints and muscles involved in human movement; application of the principles of movements for the analysis and evaluation of selected physical education activities. 3 lectures. Prerequisite: Zoo 235

PE 303 Physiology of Exercise (3)
Effects of physical activity upon the circulatory, respiratory, and other physiological systems. Relationship of strength, co-ordination, flexibility, endurance, fatigue, conditioning, and related factors to human movement and athletic performance. 3 lectures. Prerequisite: PE 302

PE 316 Social and Outdoor Education (3)
Techniques in the development of leadership for recreational activities particularly as applied to outdoor camping. Social development and integration of individuals into group programs. 3 lectures.

PE 320 Driver Education and Driver Training (3)
Recommended procedures used in training drivers of high school ages. Attitudes and practices; behind the wheel teaching techniques. 2 lectures, 1 laboratory.
Arts and Sciences Division

PE 321 Football Coaching Theory and Practice (2)
Fundamentals and systems of offensive and defensive football. Care and purchase of equipment, supplies and facilities. Rules of the game. 1 lecture, 1 two-hour laboratory.

PE 323 Baseball Coaching Theory and Practice (2)
Methods and problems of teaching and coaching baseball at the secondary school level. Strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 two-hour laboratory.

PE 324, 325, 326 Teaching Progression in Girls' Sports (2) (2) (2)
Fundamentals and techniques of the following sports: basketball, softball, badminton, archery, tennis, soccer, speedball, speed-a-way, hockey, volleyball, golf. 1 lecture, 1 two-hour laboratory.

PE 327 Teaching Elementary School Physical Education (3)
Aims, objectives, program planning, methods, and evaluation of elementary school physical education programs. Experience in conducting games of elementary level. 2 lectures, 1 two-hour laboratory.

PE 333 Track and Field Coaching Theory and Practice (2)
Coaching techniques for various track and field events. Problems of team balance; study of rules. 1 lecture, 1 two-hour laboratory.

PE 334 Introduction to Dance (3)
Fundamental knowledge and skills in dance, including rhythm analysis and social-recreation dance. For the prospective teacher. 1 lecture, 2 two-hour laboratories.

PE 337 Techniques of Officiating (2)
Problems, techniques, and practices of officiating major and minor sports in season. 1 lecture, 1 two-hour laboratory.

PE 341, 342, 343 Direction of Physical Education Activity (1) (1) (1)
Required of all majors in physical education. Under close staff supervision students conduct regular physical education classes. 2 one-hour periods.

PE 400 Special Problems for Advanced Undergraduates (1-2)
Total credit limited to 4 units with not more than 2 units in any one quarter. Prerequisite: Senior standing or permission of instructor.

PE 401 Organization and Administration of Physical Education (3)
Underlying philosophy, principles, policies, and procedures of administration applied to health and physical education. Legal aspects and interrelationships with the general school curriculum at local, state, and national levels. 3 lectures.

PE 403 Curriculum and Methods in Health and Physical Education (3)
Methods, curricular materials, and evaluation procedures in elementary and secondary school health and physical education. Directed observations, field experience; class organization, management of games and relays. 3 lectures.

PE 405 Administration of School Health Education (2)
Principles, policies, and practices in the administration of the school health curriculum. Their relation to public and private health agencies in the community. Teaching methods and materials in health education classes. 2 lectures.

PE 406 Adaptive Physical Education (3)
Growth and development patterns; their relation to special and regular physical education programs; needs and methods for administering a recreation program for the handicapped. Analysis of postural divergencies and procedures for prevention and correction. 3 lectures. Prerequisite: PE 303

PE 422 Basketball Coaching Theory and Practice (2)
Fundamental individual basketball skills. Theories of offensive and defensive team play. 1 lecture, 1 two-hour laboratory.
PE 423 Field Work in Recreation (4)
Observation and participation in a community or industrial recreation program. 1 lecture, 3 two-hour laboratories. Prerequisite: Senior standing, PE 224 or departmental approval.

PE 425 Tests and Measurements in Physical Education (3)
Physical tests and measurements of skill, strength, speed, agility, and endurance as a basis for grading and evaluating the program and as a measure of progress in activities. 2 lectures, 1 two-hour laboratory.

PE 427 Advanced Sports Theory (2)
Theory and strategy of interscholastic and intercollegiate sports in season. Audiovisual, statistical, and scouting techniques as coaching aids. 1 lecture, 1 two-hour laboratory. Prerequisite: Completion of the appropriate Theory of Coaching course, one year of intercollegiate experience in the sport, or permission of the instructor.

PE 432 Athletic Training and Massage (1)
Prevention, examination, and care of athletic injuries, methods of taping, bandaging, and therapeutic exercises applied to athletic injuries, diets, training room equipment, protective devices, and supplies. 1 combined lecture and laboratory.

PE 441, 442, 443 Minor Sports Theory and Practice (1) (1) (1)
Fundamentals and techniques of the following minor sports: boxing, wrestling, tennis, golf, gymnastics, badminton, and six-man football. 1 two-hour laboratory.

PE 446, 447, 448 Teaching Progression in Dance (2) (2) (2)
Teaching progression in dance: folk, contemporary, and social. 2 two-hour laboratories. Prerequisite: PE 334

PE 461, 462 Senior Project (2) (2)
Selection and completion of a project under a minimum of 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.

PE 463 Undergraduate Seminar (2)
Discussion of new developments in recreation, health, and physical education. 2 lectures.

PE 590 Seminar in Physical and Health Education (1-3)
Special problems in selected areas of health education and physical education. Maximum of nine units credit may be earned. 1 to 3 lecture-discussions. Prerequisite: Graduate standing.
Three options are available for students desiring to major in the Physical Sciences. Courses may be selected to specialize in physics or in chemistry. As a third choice, courses may be selected which lead to a more general program embracing physics, chemistry and the earth sciences. These three options have different objectives and lead to different careers.

The student concentrating in chemistry or in physics will find himself prepared for careers as a chemist or as a physicist in industry or governmental service. These programs also provide prerequisites for entrance to graduate work at universities. These options, together with the third or physical sciences option, satisfy the requirements for subject matter majors leading to a secondary teaching credential. The physical sciences option is especially suitable for students with a number of transfer credits in the earth sciences. Students following this program may obtain jobs in industry as technicians or in business where some knowledge of chemistry, physics, astronomy, geology, or mineralogy is useful. By choosing the proper electives in any of the three options, students planning to enter medicine, dentistry, or some other scientific field may meet the entrance requirements for such professions and also obtain the B.S. degree.

Students majoring in engineering, agriculture or life science will find courses designed to give them the necessary background for an understanding of the scientific principles which underly their practical work. The department also contributes to the general education of business and other arts and sciences majors by giving them a thorough foundation in the method and factual content of the physical sciences and the roles they play in modern society.

Department facilities include modern scientific equipment which allows the student to become acquainted with the latest techniques. It is recommended that the high school student planning to major in Physical Sciences include in his high school program three semesters of algebra, one of trigonometry, two of geometry, two of physics, and two of chemistry.

**CURRICULAR OPTIONS**

**Chemistry**

The chemistry option emphasizes chemistry and consists of beginning and advanced courses which lead to careers in chemistry. Students interested in special applications to food chemistry may elect courses designed to prepare for employment in that field.

**Physics**

The physics option emphasizes physics and mathematics. The career objective is employment in the field of physics.

**Physical Sciences**

This option includes courses in physics, in chemistry, and in the earth sciences. The curriculum provides a foundation in these natural sciences for persons who plan careers calling for a depth of knowledge in a broad area of the physical sciences.
## CURRICULUM IN PHYSICAL SCIENCES

### Freshman

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<td>General Chemistry (Chem 321, 322, 323)</td>
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<td>General Physics (Phys 131, 132, 133 or 204)</td>
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<td>Biological Sciences</td>
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<td>College Algebra and Trigonometry (Math 117)</td>
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<td>Health Education (PE 107)</td>
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<td><strong>Total</strong></td>
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### Sophomore

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<td>Principles of Economics (Ec 201, 202)</td>
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<td>Analytic Geometry and Calculus (Math 202, 203)</td>
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<td>General Psychology (Psy 202)</td>
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<td>Literature</td>
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<td>Public Speaking (Sp 200)</td>
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<td>Optics and Atomic Physics (Phys 211)</td>
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### Junior

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<td>Undergraduate Seminar (Phys or Chem 463)</td>
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<td>Electives and courses to complete major</td>
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### CHEMISTRY OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

#### Freshman

<table>
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<tr>
<td>Chem 171 Chemistry Laboratory Practices</td>
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<td><strong>Total</strong></td>
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#### Sophomore

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<tr>
<td>Chem 340 Nutrition</td>
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#### Junior

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<tr>
<td>Chem 326-7, 330 Organic Chemistry</td>
<td>(12)</td>
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<tr>
<td>Chem 328-9 Biochemistry</td>
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* To be selected from General Education list.
Junior
Phys 301 Physics of Thermal Phenomena .......... (3)
Phys 303-4-5 Mathematical Methods in Applied Physics .......... (9)
Phys 313-4 Physics of Electrical and Magnetic Phenomena .......... (6)
Math 316-7 Differential Equations .......... (6)
Senior
Phys 401-2 Modern Physics .......... (6)
Phys 403 Advanced Nuclear Physics .......... (3)
Phys 406 Solid State Physics .......... (3)
Phys 407 Statistical Physics .......... (3)
Phys 408 Quantum Mechanics .......... (3)
Phys 430 Advanced Physics Laboratory .......... (3)

PHYSICAL SCIENCES OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)
Sophomore
SS 121 Soils .......... (4)
PSc 216 Astronomy .......... (3)
Junior
PSc 320 Historical Geology .......... (3)
PSc 321 Mineralogy .......... (3)
PSc 322 Geomorphology .......... (3)
PSc 329 Physical Geology .......... (4)
Chem 326 Organic Chemistry .......... (4)
Chem 328 Biochemistry I .......... (4)
Senior
Chem 337 Soil Analysis .......... (2)
Chem 338 Plant Tissue Analysis .......... (2)
Phys 339 Soil Physics .......... (2)
Phys 401, 402 Modern Physics .......... (6)

DESCRIPTIONS OF COURSES IN CHEMISTRY
Chem 4 Preparatory Chemistry (3)
For students whose background is deficient in chemistry. Symbols, nomenclature, molecular theory, problems dealing with the metric system, density, formulas, percentage composition, and chemical equations. 3 lectures. Prerequisite: Math 112
Chem 121 Introduction to Foods (3)
Elementary principles and practices in the selection and preparation of foods. Historical aspects of food science and its relationship to human health and progress. World's food supply and food habits. 2 lectures, 1 laboratory.
Chem 171 Chemical Laboratory Practices (1)
The use, care, and handling of laboratory glassware and apparatus. Fundamental techniques of glass blowing. Safety procedures. 1 laboratory.
Chem 321 General Chemistry (4)
General principles emphasizing correlation of properties of elements with atomic structure. Fundamental reactions and elementary equilibria. For science, engineering, and math students. 3 lectures, 1 laboratory. Prerequisite: PSc 103 or Chem 4 or satisfactory score in the chemistry placement test.
Chem 322 General Chemistry (4)
The metals, electrochemistry, properties of solutions, nuclear chemistry. Introductory thermodynamics, and kinetics. Introduction to the chemistry of the carbon and silicon compounds, high polymers, fuels, etc. 3 lectures, 1 laboratory. Prerequisite: Chem 321
Chem 323 General Chemistry (4)
Applications and limitations of analytical chemistry. Predicting direction and extent of reactions. Selection of materials for science and engineering problems using theoretical principles of electrostatics. Qualitative analysis in the laboratory. 2 lectures, 2 laboratories. Prerequisite: Chem 322 or 325
Chem 324 General Inorganic Chemistry (4)
Fundamental principles including atomic structure, periodic classification of the elements, fund reactions, electrochemistry, and chemical calculations. For agricultural majors. 3 lectures, 1 laboratory. Prerequisite: PSc 103 or Chem 4 or the passing of a placement test.

Chem 325 General Inorganic Chemistry (4)
Basic principles of equilibrium, solution, and colloids. Properties of the common elements and their compounds with applications to agriculture. 3 lectures, 1 laboratory. Prerequisite: Chem 324

Chem 326 Organic Chemistry (4)
The fundamental concepts of organic chemistry with applications for science, engineering and agriculture students. 3 lectures, 1 laboratory. Prerequisite: Chem 321 or 324

Chem 327 Organic Chemistry (4)
Aliphatic compounds and reactions emphasizing modern physical-organic concepts. The laboratory work stresses organic synthesis and qualitative analysis of organic compounds. 3 lectures, 1 laboratory. Prerequisite: Chem 326

Chem 328 Biochemistry I (4)
Chemistry of carbohydrates, lipids, proteins and other classes of substances found in living tissues. Chemical nature of enzymes and their action including digestion and intermediary metabolism. Laboratory work includes test-tube reactions, enzymology and analytical procedures employing volumetric and colorimetric procedures. 3 lectures, 1 laboratory. Prerequisite: Chem 326

Chem 329 Biochemistry II (4)
Chemistry of metabolic processes in plants and animals including respiration, functions of blood, hormones, nitrogen, metabolism, energy metabolism and chemical aspects of nutrition. Laboratory work includes the study of live plants and animals as well as surviving tissues. 3 lectures, 1 laboratory. Prerequisite: Chem 328

Chem 330 Organic Chemistry (4)
Continuation of Chem 327 to include a survey of aromatic compounds and reactions. 3 lectures, 1 laboratory. Prerequisite: Chem 327

Chem 331 Quantitative Analysis I (4)
Principles and techniques involved in fundamental gravimetric and volumetric analysis. Laboratory work is the focal point, with class discussion supplying supporting theory. Emphasis on application of chemical equilibrium and methods of problem solving. 2 lectures, 2 laboratories. Prerequisite: Chem 322 or 325

Chem 332 Quantitative Analysis II (4)
A continuation of Chem 331 but with greater emphasis on theory, analytical problems in acidimetry and alkalimetry, oxidimetry, electrolytic deposition and colorimetric analysis. 2 lectures, 2 laboratories. Prerequisite: Chem 331

** Chem 333 Instrumental Methods of Analysis (3)
Spectrophotometry, electroanalysis, and other instrumental methods of analysis. 2 lectures, 1 laboratory. Prerequisite: Chem 331

Chem 334 Radiochemistry (4)

** Offered in even-numbered years.
Chem 337  Soil Analysis (2)
Chemical analysis as a means of diagnosing problems related to western soils. 1 lecture, 1 laboratory. Prerequisite: Chem 322 or 325

Chem 338  Plant Tissue Analysis (2)
Chemical analysis of plant tissue as a guide to fertilization and crop production. 1 lecture, 1 laboratory. Prerequisite: Chem 322 or 325

Chem 340  Nutrition (3)
Chemical composition of foods and their utilization by living organisms. Fundamental principles and problems of human nutrition. 2 lectures, 1 laboratory.

Chem 400  Special Problems for Advanced Undergraduates (1-2)
Individual or group investigations for advanced students. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

Chem 421  Advanced Nutrition (3)
Qualitative, quantitative and intermediary metabolic studies of diets. 1 lecture, 2 laboratories.

Chem 428  Dietetics (3)
Qualitative and quantitative studies of the normal diets for persons of various ages and occupations. Planning and computation of diets. 2 lectures, 1 laboratory.

Chem 429  Diet Therapy (3)
Relationship between diet and health with particular emphasis on specific dietary requirements associated with certain diseases and conditions. 2 lectures, 1 laboratory.

Chem 430  Advanced Inorganic Chemistry (4)
Detailed study of the inorganic elements based on periodic grouping and stressing electronic configuration, physical and chemical properties. 3 lectures, 1 laboratory. Prerequisite: Chem 323

Chem 431  Physical Chemistry I (4)
Physical properties and molecular constitution of gases, solids, and liquids. Elements of crystallography. Thermochemistry. Chemical thermodynamics. 3 lectures, 1 laboratory. Prerequisites: Math 203 and Chem 323

Chem 432  Physical Chemistry II (4)
Solutions of volatile and nonvolatile solutes. Homogeneous and heterogeneous equilibria. Theories of rate processes. Chemical kinetics. General and enzymatic catalysis. 3 lectures, 1 laboratory. Prerequisite: Chem 431

Chem 433  Physical Chemistry III (4)
Electric conductance and emg measurements. Behavior of dispersed systems including colloids. Theory and analytical applications of adsorption. Photochemistry. 3 lectures, 1 laboratory. Prerequisite: Chem 432

Chem 435  Food Analysis (4)
Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, meat and meat products, milk and dairy products, egg and poultry products. Problems of chemical and biological deterioration. Detection of adulterants and legal specifications, packaging, grading and labeling. 2 lectures, 2 laboratories.

Chem 461, 462  Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum of 120 hours total time.

Chem 463  Undergraduate Seminar (2)
A study of current developments in chemistry and a discussion of periodical literature at an appropriate level. 2 lecture-discussions.
DESCRIPTIONS OF COURSES IN PHYSICS

Phys 121 College Physics (4)
Principles of mechanics and heat. Statics, uniform motion, accelerated motion, Newton's second law, work and energy, impulse and momentum, rotational motion, fundamentals of heat, properties of gases, heat flow. 3 lectures, 1 laboratory. For non-engineering students. Prerequisite: Math 101

Phys 122 College Physics (4)
Sound and light. Simple harmonic motion. Wave motion, Doppler effect, acoustical phenomena, geometrical and physical optics, elements of spectroscopy. 3 lectures, 1 laboratory. For non-engineering students. Prerequisite: Phys 121

Phys 123 College Physics (4)
Electrostatics, magnetostatics, current electricity, potential, dielectrics, capacitance, Ohm's Law, electromagnetics. 3 lectures, 1 recitation. For non-engineering students. Prerequisite: Phys 122

Phys 131 General Physics (4)
Fundamental principles of mechanics. Vectors, statics, uniform motion, accelerated motion, work and energy, rotational motion, elasticity, impact, and harmonic motion. 3 lectures, 1 laboratory. Concurrent: Math 118 or higher.

Phys 132 General Physics (4)
Fundamental principles of hydraulics, heat, sound, and light. Fluids at rest and in motion, temperature, expansion, quantity of heat, heat transfer, thermodynamics, thermal properties of matter, wave motion, vibrating bodies, acoustical phenomena, nature and propagation of light, geometric optics. 3 lectures, 1 laboratory. Prerequisite: Phys 131

Phys 133 General Physics (4)
Fundamental principles of magnetostatics, electrostatics, and current electricity. Coulomb's law, electric field, potential, properties of dielectrics, capacitance, Ohm's law, magnetism and magnetic fields, measuring instruments, magnetic field of a moving charge, induced emg, ac circuits. 3 lectures, 1 laboratory. Prerequisite: Phys 131

Phys 204 Physics of Electricity and Magnetism (4)
Coulomb's law, the electrostatic field, potential, properties of dielectrics, capacitance and capacitors, the magnetostatic field, the magnetic field of a current, induced electromotive force, inductance, magnetic properties of matter. 4 lectures. Prerequisite: Phys 131 and Math 201

Phys 211 Elementary Physical Optics and Atomic Physics (3)
Basic physical optics and applications. Introduction to the fundamental particles, interpretation of spectra, radioactivity and atomic structure. 3 lectures. Prerequisite: Phys 133 or 204

** Phys 213 Introduction to Nuclear Physics (3)
Elementary theory of nuclear structure, including a study of nuclear reactions, particle accelerators, and nuclear instruments. Application in atomic energy and nuclear engineering. 3 lectures. Prerequisite: Phys 211

Phys 222 Sound (3)
Vibratory motion. Transverse waves, longitudinal waves, vibration of bars. Velocity of sound, vibrating air columns. Interference. Intensity and intensity level. Loudness and loudness level. 2 lectures, 1 laboratory. Prerequisite: Phys 133 or 204

** Offered in even-numbered years.
Phys 223 Light (4)
The physical nature of light. Reflection, refraction, diffraction, interference, polarization, and absorption of light. 2 lectures, 2 laboratories. Prerequisite: Phys 133 or 204.

Phys 301 Physics of Thermal Phenomena (3)
The physical nature of thermal processes. Fundamental concepts of thermodynamics and thermodynamic systems necessary for the treatment of practical problems dealing with phenomena associated with heat flow and the utilization of thermal energy. 3 lectures. Prerequisite: Phys 133 or 204 and Math 203.

Phys 303, 304, 305 Mathematical Methods in Applied Physics (3) (3) (3)
Solution of practical problems in physics by mathematical methods. Analysis of phenomena involving motion of particles and rigid bodies using such techniques as vector calculus, differential equations, calculus of variation, and complex variables, Lagrange's and Hamilton's equations. 3 lectures. Prerequisite: Phys 133 or 204, and Math 316.

Phys 313, 314 Physics of Electrical and Magnetic Phenomena (3) (3)
Principles of electrical and magnetic phenomena of fundamental importance in practical application. Static electric and magnetic fields, dielectric and magnetic materials, magnetic effects of currents, Maxwell's field equations. 3 lectures. Prerequisite: Phys 133 or 204, Phys 304, and Math 316.

Phys 339 Soil Physics (2)
Fundamental aspects of soil physics and its application. 1 lecture, 1 laboratory. Prerequisite: SS 121.

Phys 400 Special Problems for Advanced Undergraduates (1-2)
Individual or group investigations for advanced students. Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

Phys 401 Modern Physics (3)
Atomic theory of matter, fundamental atomic particles. Thermal radiation and quantum theory, atomic and nuclear structure, electromagnetic radiation effects. 3 lectures. Prerequisite: Phys 133 or 204 and Math 203.

Phys 402 Modern Physics (3)
Special theory of relativity, X-ray phenomena, wave-particle duality, quanta and atoms, wave mechanics, applications of quantum mechanics. 3 lectures. Prerequisite: Phys 401.

* Phys 403 Advanced Nuclear Physics (3)
Natural and induced radioactivity, induced nuclear disintegration and nuclear reactions, interactions with matter of charged particles and gamma rays. Neutron physics, nuclear fusion, nuclear fission, nuclear reactions and related applications. 3 lectures. Prerequisite: Phys 402.

Phys 406 Solid State Physics (3)
The crystalline structure of solids. Properties of metallic and ionic lattices. Electrical properties of insulators, metals and semi-conductors. 3 lectures. Prerequisite: Phys 406.

Phys 407 Statistical Physics (3)
Study of the statistical behavior of physical systems composed of large numbers of similar particles. Applications to thermal phenomena and the physics of gases. 3 lectures. Prerequisite: Math 316, Phys 301.

* Offered in odd-numbered years.
Phys 408  Quantum Mechanics (3)
Experimental foundations of quantum theory. The Schroedinger wave equation and its interpretation. Solutions for one dimensional problems and the one electron atom. 3 lectures. Prerequisite: Math 316, Phys 401

Phys 430  Advanced Physics Laboratory (3)
Selected topics in advanced experimental physics. 3 laboratories. Prerequisite: Consent of department.

Phys 461, 462  Senior Project (2) (2)
Selection and completion of a project under a minimum of supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum of 120 hours total time.

Phys 463  Undergraduate Seminar (2)
Study of current developments in physics and discussion of periodicals of an appropriate level. 2 lecture-discussions.

DESCRIPTIONS OF COURSES IN PHYSICAL SCIENCE

PSc 101  General Physical Science (4)
Geological features and processes. Astronomical phenomena and concepts. The development of a better understanding of man's physical environment. The scientific method of working and thinking. PSc 101 is not open to students who have credit for PSc 329 or 216. 3 lectures, 1 recitation.

PSc 102  General Physical Science (4)
Fundamental principles of physics. Various theories of matter and energy and the principles and laws that describe their behavior and applications. Some special knowledge of modern science that will function in a socially desirable manner in the lives of students. PSc 102 is not open to students who have credit for Phys 121 or 131. 3 lectures, 1 recitation. Prerequisite: A college math course.

PSc 103  General Physical Science (4)
Fundamental principles of chemistry. Chemical changes and their uses. A number of recent advances. Objective observation and experimentation in the solution of problems relating to natural phenomena. PSc 103 is not open to students who have credit for Chem 321 or 324. 3 lectures, 1 recitation.

PSc 216  Astronomy (3)
Astronomical properties of the earth, solar system, stars, and galaxies. Principles and methods of astronomical investigation, designed primarily for students majoring in a physical science or mathematics. 3 lectures. Prerequisite: Math 117 or permission of instructor.

PSc 320  Historical Geology (3)
A description of the evolution of landscapes beginning with the origin of the earth. Includes discussions of conditions and changes occurring during successive geologic ages. 2 lectures, 1 laboratory. Prerequisite: PSc 329

* PSc 321  Mineralogy (3)
Identification and occurrence of common rocks and minerals. Includes elementary crystallography, physical and chemical examinations of minerals and descriptive mineralogy. 2 lectures, 1 laboratory. Prerequisite: PSc 329

** PSc 322  Geomorphology (3)
Various landforms and interpretation of forces resulting in these landforms. 2 lectures, 1 laboratory. Prerequisite: PSc 329

* Offered in odd-numbered years.
** Offered in even-numbered years.
PSc 329  Physical Geology  (4)
Fundamental geologic processes. General surface features of the earth. Rocks and minerals. 3 lectures, 1 laboratory. Not open for credit to students who have completed PSc 101.

PSc 521  Curriculum and Methods in the Physical Sciences  (3)
Techniques, aims and objectives in the teaching of physics, chemistry, physical science and general science at the secondary school level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: AV 431, Ed 402, graduate standing, and admission to teacher preparation program.

PSc 590  Seminar in the Physical Sciences  (1-3)
Special problems in selected areas of physics and chemistry. Maximum of six units may be earned. 1 to 3 lectures. Prerequisite: Graduate standing.
The Social Sciences Department serves Agriculture, Business, Engineering, and Arts and Sciences students by providing courses that give the necessary backgrounds in anthropology, economics, education, geography, history, philosophy, political science, psychology and sociology. In the area of general education, the department prepares the student to understand himself and others better, and to grasp the significance of the major social and philosophical problems of mankind.

The department offers a social sciences major planned to prepare students for entry jobs in civil service, business, industry, and social services, and also to prepare elementary and secondary school teachers of the social studies. The student will elect an option in Economics, Social Services or Social Sciences depending upon his occupational objective. He is further encouraged and advised to select elective courses that will more effectively prepare him for successful employment and worthwhile citizenship. The course offerings in this department also assist majors in other departments to prepare themselves for civil service positions by providing information of value on the job and in preparation for civil-service examinations.

There are no special requirements for admission to the social sciences major. Since courses in the social sciences generally have heavy reading requirements, it is recommended that high school students interested in this major field seek to develop their reading skills before entering college.

**CURRICULAR OPTIONS**

**Social Services**

This option provides basic instruction and actual experience in social services and the case-study method, preparing the students for entry jobs in many types of social service agencies.

**Social Sciences**

The student receives a broad background leading to positions in business and government such as management trainee. By proper selection of electives, this option leads to preparation for elementary or secondary teaching upon completion of the fifth year.

**Economics**

The option in economics stresses economic analysis and the applied aspects of economics related to business and government.

**CURRICULUM IN SOCIAL SCIENCES**

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<thead>
<tr>
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<td>Freshman</td>
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<tr>
<td>Principles of Sociology (Soc 201, 202, 203) or Principles of Anthropology (Ant 201, 202, 203)</td>
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<td>History of Civilization (Hist 101, 102, 103)</td>
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* To be selected from the General Education list.
### Sophomore

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<td>Principles of Economics (Ec 201, 202, 203)</td>
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<td>Principles of Political Science (Pol Sc 201, 202)</td>
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<td>* Natural Sciences</td>
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<td>History of the United States (Hist 201, 202, 203)</td>
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<tr>
<td>* Literature</td>
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<td>Introduction to Philosophy (Phil 201)</td>
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### Senior

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<td>Social Psychology (Psy 401) or Contemporary Social Problems (Soc 311)</td>
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<td>Senior Project (Soc Sc 461, 462)</td>
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<td>Undergraduate Seminar (Soc Sc 463)</td>
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<td>Public Speaking (Sp 200)</td>
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<td>Electives and courses to complete major</td>
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### Social Services Option (Add Courses Below to Basic Curriculum)

#### Sophomore

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<tbody>
<tr>
<td>Eng 216 Report Writing</td>
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<tr>
<td>Ant 311 Culture and Personality</td>
<td>(3)</td>
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<tr>
<td>Ant 312 Applied Anthropology</td>
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<tr>
<td>Soc 401 Urban Sociology</td>
<td>(3)</td>
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<tr>
<td>Soc 221-2-3 Introduction to Social Services</td>
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#### Senior

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<th>Course</th>
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<tbody>
<tr>
<td>Soc 321-2-3 Field Work in Social Services</td>
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<tr>
<td>Psy 304 Human Relations</td>
<td>(3)</td>
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<tr>
<td>** Psy 305 Child Growth and Development or</td>
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<tr>
<td>** Psy 206 Family Relations</td>
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### Social Sciences Option (Add Courses Below to Basic Curriculum)

#### Sophomore

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Psy 223 General Psychology II</td>
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<tr>
<td>Geog 201 Principles of Geography</td>
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#### Junior

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<th>Course</th>
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<tbody>
<tr>
<td>Hist 321 History of California</td>
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<tr>
<td>Hist 315 History of 20th Century Europe</td>
<td>(3)</td>
</tr>
<tr>
<td>Hist 313 History of Latin America</td>
<td>(3)</td>
</tr>
<tr>
<td>Hist 417 History of Soviet Area or Soc 401 Urban Sociology</td>
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#### Senior

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Geog 301 Regional World Geography</td>
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<tr>
<td>Pol Sc 315 Recent and Contemporary Ideologies</td>
<td>(3)</td>
</tr>
<tr>
<td>Pol Sc 401 State and Local Government</td>
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<tr>
<td>Pol Sc 415 American Political and Social Thought</td>
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<tr>
<td>To be selected with direct approval of the student's adviser</td>
<td>(9)</td>
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</tbody>
</table>

* To be selected from the General Education list.  
* * Physical Education Majors will substitute Principles of Sociology (Soc 201, 202, 203) in place of these courses.
ECONOMICS OPTION (ADD COURSES BELOW TO BASIC CURRICULUM)

Sophomore
Ec 231 Development of Economic Doctrine .................... (3)
Ec 251 Price and Income Analysis.............................. (5)
Math 211 Statistics ............................................ (3)

Junior
Ec 301 Public Finance ........................................... (3)
Ec 302 Business and Government ................................ (3)
Ec 308 Money and Banking ..................................... (3)
Geog 312 Economic Geography and World Resources ............ (3)

Senior
Ec 401 International Trade and Finance ...................... (3)
Ec 402 Economic Development ................................ (3)
Ec 403 Comparative Economic Systems ......................... (3)
Ec 413 Managerial Economics ................................ (3)
Ec 414 Labor Economics ........................................ (3)

DESCRIPTIONS OF COURSES IN AMERICAN CIVILIZATION

Am Civ 301, 302, 303 American Civilization (3) (3) (3)
An analysis of American Civilization with emphasis on the social, political, and economic ideas and practices which have moulded the unique American character; emphasis on American Government, American ideals, and the United States and the contemporary world. Courses to be taken in sequence. 3 lectures.

DESCRIPTIONS OF COURSES IN ANTHROPOLOGY

Ant 201, 202, 203 Principles of Anthropology (3) (3) (3)
Physical, cultural and social anthropology; human evolution and heredity; racial classification; the nature of culture; cultural phenomena; comparative social organization; religion and value systems of non-literate and folk peoples; culture and psychological processes in the development of personality. 3 lectures.

Ant 311 Culture and Personality (3)
Relations of variations in culture to personality development in different societies, both primitive and modern. Comparative study of the interrelationships of cultural milieu, child training and education. 3 lectures. Prerequisite: Ant 203 or Soc 201

Ant 312 Applied Anthropology (3)
The application of anthropological knowledge to the solution of practical problems in social work, education, race relations, public administration, international relations, and economic development. 3 lectures. Prerequisite: Ant 203

DESCRIPTIONS OF COURSES IN ECONOMICS

Ec 201, 202, 203 Principles of Economics (3) (3) (3)
How the economic system works. The forces which determine the efficiency of the allocation, utilization, and distribution of resources. The determinants of national income, output, prices, and employment. Applications of economic analysis. International economic problems. 3 lectures.

Ec 213 Economic Problems (3)
Specific current economic problems selected with reference to the needs of the students. 3 lectures. Prerequisite: Ec 202

Ec 231 Development of Economic Doctrine (3)
The development of economic ideas or doctrines from the early Greek writers through the Classical and Neo-Classical schools to the present. 3 lectures. Prerequisite: Ec 202
Ec 252 Price and Income Analysis (5)
Study of the role of prices in organizing economic activities, and of the forces determining the general level of employment and income. Develops tools of analysis used in explaining the behavior of households, firms, and market prices under various competitive conditions, the distribution of national income, and the degree of utilization and growth of the economy. 5 lectures. Prerequisite: Ec 203

Ec 301 Public Finance (3)
Principles of government financing and its various economic and social effects; collecting, spending and administration of public funds, particularly at state and local levels. 3 lectures. Prerequisite: Ec 202

Ec 302 Business and Government (3)
Economic significance of controls placed by government upon business; divergent issues arising from present relations of government to business. 3 lectures. Prerequisite: Ec 202

Ec 308 Money and Banking (3)
Relation of money and banking to the general economy; interrelationships between money and banking and production and distribution. 3 lectures. Prerequisite: Ec 202

Ec 319 Land Economics (3)
Economic principles underlying utilization and conservation of land and natural resources. Economics of urbanization; forces of demand for urban land; factors of supply; factors affecting the location of industries and other enterprises; city growth and structure. Problems of rural and urban land-use and development. 3 lectures.

Ec 401 International Trade and Finance (3)
Role and basis of trade between nations. Mechanism of international financial transactions. Barriers to trade between nations and methods of facilitating trade. The position of the United States in international economic matters. 3 lectures. Prerequisite: Ec 202

Ec 402 Economic Development (3)
Problems of economic growth and development. 3 lectures. Prerequisite: Ec 202

Ec 403 Comparative Economic Systems (3)
Examination of alternative economic organizations, ranging from free enterprise to fully planned economics. 3 lectures. Prerequisite: Ec 202

Ec 413 Managerial Economics (3)
How economic analysis can be used in formulating business policies; analysis of the social impact of management's role in the economy. 3 lectures. Prerequisite: Ec 202

Ec 414 Labor Economics (3)
Economic analysis of the facts and forces in wage determination. Economic importance of access to jobs, unemployment insurance, governmental policy, and union functions, such as health, housing and education. 3 lectures. Prerequisite: Ec 202

DESCRIPTIONS OF PROFESSIONAL COURSES FOR TEACHER PREPARATION

Ed 107 Introduction to Education (3)
Nature of the teaching profession. Qualifications of successful teachers. Analysis of duties and functions of elementary and secondary school teaching. School law and certification requirements. Opportunities for advancement. Observation of teaching situations in public schools. 3 lectures.
Ed 200 School Observation (½)
Supervised observation of children in the classroom and on the college campus. May be repeated for total of one unit of credit.

Ed 301 Principles of Education (3)
Purposes, organization, and development of the public school in America. Emphasis on the elementary and secondary school curriculum through intensive study and school visitations. 3 lectures.

Ed 403 Secondary School Teaching Plans and Techniques (5)
Planning lessons, unit development, specific skills, class management, and utilization of community resources and relationships. Demonstrations and observation in secondary schools. Classroom planning co-ordinated with public school practice. Visual and auditory methods and materials of value in classroom teaching. 5 lectures. Prerequisite: Psy 312 and admission to teacher education program.

Ed 420, 421, 422 Materials and Methods in Elementary Education (3) (3) (3)
An integrated study of curriculum materials and methods of teaching in the elementary school, including audio-visual techniques. General methods of teaching with special attention to instruction in the social studies, music, art, physical education, communication arts, mathematics, sciences, and reading. 3 lectures. Prerequisite: Admission to teacher education program.

Ed 430 Student Teaching (Secondary) (3-12)
Student teaching includes participation, teaching, and allied activities under the direction of a selected regular teacher in a public school with consultation from college supervisors. The application for student teaching must be approved one quarter prior to registration for this course.

Ed 431 Student Teaching (Elementary) (3-12)
Observation and teaching under direction of a selected regular teacher in an elementary school. Participation in a wide variety of representative public elementary school activities. The application for student teaching must be approved one quarter prior to registration for this course.

DESCRIPTIONS OF COURSES IN GEOGRAPHY

Geog 201, 202 Principles of Geography (3) (3)
Basic principles of physical, cultural and political geography. Significance of distribution patterns with reference to their effect on man’s activities. 3 lectures.

Geog 301 Regional World Geography (3)
Major geographic regions of the world: their climates, landforms, soils, flora, fauna, agricultural systems, industries. Intensive study of selected regions. 3 lectures.

Geog 312 Economic Geography and World Resources (3)
Economic aspects of man’s environment. Economic implications of the distribution or location of natural resources throughout the world. Economic significance of physical and cultural landscapes throughout the world. 3 lecture-discussions. Prerequisite: Ec 201, 202

DESCRIPTIONS OF COURSES IN HISTORY

Hist 101, 102, 103 History of Civilization (5) (5) (5)
Development of civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 5 lectures.

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. 3 lectures.
Hist 311 History of the Far East (3)
Historic background of the Far East since the 18th century. Development of major Oriental powers. United States influence, interests and responsibilities in the Far East. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Hist 312 History of Southwest Asia and Africa (3)
Twentieth century developments in the Middle East, India, and Africa. Modern imperialism and the recent rise of nationalistic forces in those areas. Political and economic trends; social, religious, and cultural factors in these areas. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Hist 313 History of Latin America (3)
Survey of Latin America from the 15th century to the present. Emphasis on the economic, cultural, and historical development of the area. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Hist 321 History of California (3)
Development of California; early explorations, colonizations; organization, government, and economy from beginnings to the present; development of culture, industry, agriculture, government, and population. 3 lectures.

Hist 414 Social and Agrarian Reform (3)
American social and agrarian reform movements. Penal reform, land reform, women's rights, and peace movements; economic reforms in the Twentieth Century. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Hist 415 Europe in the 20th Century (3)
The political, economic, and social forces which have influenced the great powers of Europe in the 20th Century. The development of 20th Century ideologies. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Hist 417 History of the Soviet Area (3)
A survey of modern Russian history with an emphasis on the post World War I period. The rise of Communism and its subsequent spread throughout Eastern Europe and Asia. 3 lectures. Prerequisite: Junior standing or permission of instructor.

DESCRIPTIONS OF COURSES IN LIBRARY

Lib 103 Library and Bibliographical Techniques (3)
Fundamentals of finding information in the library and of obtaining information from government and commercial sources. General and specialized bibliographical citations. 3 lectures.

Lib 331 Library Techniques for Teachers (3)
Current school library practices. The organization and the administration of school libraries; review of the sources of teacher's materials. 3 lectures. Prerequisite: Lib 103

DESCRIPTIONS OF COURSES IN PHILOSOPHY

Phil 201 Introduction of Philosophy (3)
A study of the purposes and meaning of philosophy for intelligent living. The study of philosophic methods and a study by philosophic method of issues traditional to philosophy and their relevance to contemporary living. A study of the methods, values and theories of philosophical systems, ancient to modern through a problem approach. 3 lectures.

Phil 202 Logic (3)
A study of inductive and deductive processes in reasoning. The uses of logic in science and in daily life. Analysis of fallacies; their detection in daily life. Study of logic and language, rules of deductive inference, symbolic processes in logical calculation, the rules of argumentation, formation and validation of scientific hypotheses, analysis of proposition, the syllogism. 3 lectures.
Phil 204 Ethics (3)
The implications of ethics and ethical systems. The meaning of right and wrong. Sanctions and sources of morality. Inquiry into the principles of the morality of human actions. The ethical foundations of personal and social relations. 3 lectures.

Phil 205 Symbolic Logic and Set Theory (3)
Logic of propositions and sets including sentential calculus, set operations, metamathematics, quantifications, structure of an axiomatic system, functions and relations. 3 lectures. Prerequisite: Math 101, 117, or 207

Phil 501 Philosophy of Education (3)
The function of philosophy; the meaning of education; significance of present philosophical points of view; educational aims and values; democracy and education; the relationship of various philosophical outlooks to educational methods and subject matter. 3 lectures. Prerequisite: Graduate standing and permission of instructor.

DESCRIPTIONS OF COURSES IN POLITICAL SCIENCE

Pol Sc 201, 202, 203 Principles of Political Science (3) (3) (3)
Introduction to the principal methods and concepts used to analyze, explain and justify governmental institutions and political behavior. Emphasis on national government and federal system, distribution of powers and intergovernmental relations. Comparisons will be made showing the effect of historical, cultural, ideological, institutional, and personal factors in political problem-solving. 3 lectures. Pol Sc 201 meets the state requirement in U.S. Constitution and state and local government.

Pol Sc 310 Public Administration (3)
Introduction to principles of organization, management, authority, and administrative action from the point of view of government and public service. Executive functions of government will be analyzed from the perspectives of responsibility, community welfare, and concrete problem solving. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 315 Recent and Contemporary Ideologies (3)
Analysis of the historical, cultural, and institutional roots of the various democratic, marxist, socialist, communist, liberal, conservative, and pluralist orientations toward social organization, human behavior, and governmental authority, in order better to understand the nature and function of constitutional, democratic, and republican government. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 401 State and Local Government (3)
The structure, function and problems of state, county, municipal, and district governments. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 411 Inter-American Relations (3)
Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agricultural methods. Opportunities for employment in agriculture, engineering, and business. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 412 International Relations (3)
Analysis of international organizations, including political and economic types. Problems of security, the League of Nations, the United Nations and its special agencies. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 413 Comparative Government (3)
Contemporary political situation in Britain, France, Soviet Union, Germany, Italy, and Japan. Policies and problems; forces making for conflict and adjustment. Constitutional, economic, communal, and sovereignty bases. 3 lectures. Prerequisite: Junior standing or permission of instructor.
The Arts and Sciences Division

Pol Sc 414 Political Parties and Pressure Groups (3)
Dynamics of contemporary political parties and pressure groups in the United States. Analysis of the aspirations, organization, and techniques employed by agriculture, business, and labor as well as other special interest groups. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Pol Sc 415 American Political and Social Thought (3)
American political and social thought and the philosophies of those individuals who have influenced it. 3 lectures. Prerequisite: Junior standing or permission of instructor.

DESCRIPTIONS OF COURSES IN PSYCHOLOGY

Psy 1 Reading Improvement (2)
Improvement of basic reading skills. Training in quick, accurate visual and auditory perception. Vocabulary development. Improvement of comprehension through analyses of author’s purpose and techniques. 2 lectures.

Psy 3 Study Skills (2)
Improvement of basic study skills. Study habits, principles of learning, tools of learning, orientation to college. 2 lectures.

Psy 202 General Psychology I (3)
Basic concepts, methods, and vocabulary of psychology with emphasis upon human behavior as an object of scientific study: learning, personality, growth and development, intelligence, individual differences, emotion, motivation, and adaptive behavior. 3 lectures.

Psy 205 Personal Adjustment (3)
The development of insight into human behavior; understanding self and others; principles of mental health and their application to personal adjustment. 3 lectures.

Psy 223 General Psychology II (3)
The general problems, methodology, and principles of psychology, with emphasis upon sensory functions, perception, motivation, and social interaction; elements of physiological psychology and statistical methods in psychological experimentation. 2 lectures, 1 two-hour laboratory. Prerequisite: Psy 202

Psy 305 Child Growth and Development (3)
Developmental aspects of the physical, social, emotional, and intellectual growth of the child from birth to adolescence. Focus on child as a person and emphasis on the awareness of self, at various ages, in relation to the world and environment. 3 lectures. Prerequisite: Psy 202

Psy 306 Adolescent Psychology (3)
Physical, social, emotional, and intellectual growth of the adolescent. Emphasis upon personality formation, social adjustment, and the problem of self-identity. 3 lectures. Prerequisite: Psy 202

Psy 312 Educational Psychology (3)
Psychological principles of the learning process and mental hygiene at the elementary and secondary levels. Emphasis upon learning and the motivation of the learner. 3 lectures. Prerequisite: Psy 202

Psy 314 Human Relations (3)
The problems of human relations, specifically in group situations as observed on the job. Development of skills in dealing with others especially as a committee member and chairman of groups. Development of skills through class lecture and discussion plus small-group involvement with actual business-personnel problems. 2 lectures, 1 laboratory. Prerequisite: Psy 202
Psychology

Psy 401 Social Psychology (3)

Human behavior as a product of interaction and social process; nature of group life in relation to social groupings; social conflict, public opinion, group morale, social controls, leadership. 3 lectures. Prerequisite: Psy 202 or permission of instructor.

Psy 503 Counseling and Guidance (3)

Philosophy, techniques, and administration of individual and group guidance programs. Assessment of students' interests, abilities, and achievement with respect to educational and vocational choice, and school and life orientation. 3 lectures. Prerequisite: Graduate standing and permission of instructor.

Psy 504 Evaluation in Education (3)

Preparation and use of tests; new objective tests; check lists and rating scales. Supplementary observational techniques. The use of all such devices in evaluation. Assigning grades and reporting results. 3 lectures. Prerequisite: Graduate standing and permission of instructor.

Descriptions of Courses in Social Science

Soc Sc 251, 252, 253 Laboratory in Group Activities (1) (1) (1)

Skills and techniques of solving problems in large and small groups; conducting and reporting meetings; analyses of leadership dynamics in campus organizations. 1 two-hour laboratory.

Soc Sc 400 Special Problems for Advanced Undergraduates (1-2)

Independent and group study of selected problems in the social sciences. Total credit limited to 4 units. 1 or 2 meetings. Prerequisite: Permission of instructor and junior standing.

Soc Sc 461, 462 Senior Project (2) (2)

Selection and completion of a project under a minimum of 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.

Soc Sc 463 Undergraduate Seminar (2)

Intensive study of selected social problems with application of various techniques for analysis. 2 meetings. Prerequisite: Completion of senior project.

Soc Sc 521 Curriculum and Methods in Secondary Social Studies (3)

Content, organization, and scope of social science curriculum in secondary schools. Methods of teaching. Evaluation of procedures. Observation of classroom practices in local schools. 3 meetings. Prerequisite: Admission to teacher education program and graduate standing.

Soc Sc 590 Seminar in the Social Sciences (1-3)

Special problems in selected areas of the social sciences. Each seminar will have a subtitle, describing its nature and content. 1-3 lectures. Prerequisite: Graduate standing. May be repeated for maximum of 9 units.

Descriptions of Courses in Sociology

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 206 Family Relations (3)

Analysis of dating, courtship, engagement, religion and social, marital and legal factors relating to marriage and early adjustment. Preparation for marriage. 3 lectures.
Soc 221, 222, 223  Introduction to Social Services (3) (3) (3)
Case work, social group work and community welfare organizations, their functions and orientations. Social services as a career. Practice in interviewing and report writing. Requires at least four weekly hours of directed field experience. Prerequisite: Approval of interdepartmental committee.

Soc 311  Contemporary Social Problems (3)
Analysis of leading social problems facing American society today. Observations of selected social welfare institutions. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Soc 321, 322, 323  Field Work in Social Services (3) (3) (3)
Socio-cultural and psychological backgrounds of crime and delinquency; probation and parole; family disorganization and dependency; problems of the aged and other problems dealt with by social agencies. Practice in interviewing and report writing. Intensive directed field experience. Prerequisite: Soc 223

Soc 401  Urban Sociology (3)
A comparison of the organization of the modern city with special emphasis on the social problems of the modern industrialized urban center; analysis of trends in urban communities; and ecological patterns and change. 3 lectures. Prerequisite: Junior standing or permission of instructor.

Soc 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. Prerequisite: Graduate standing and permission of instructor.
DIRECTORIES
DEPARTMENT HEADS AND CHAIRMEN
BY DIVISIONS
SAN LUIS OBISPO

AGRICULTURE DIVISION

Agricultural Business Management ........................................... Daniel C. Chase
Agricultural Education .......................................................... H. H. Burlingham
Agricultural Engineering ....................................................... James Merson
Animal Husbandry ............................................................... Lyman Bennion
Crops ..................................................................................... Corwin M. Johnson
Dairy Husbandry and Manufacturing ......................................... Harmon Toone
Farm Management .................................................................. Edgar Hyer
Food Processing ...................................................................... DeWitt F. Sampson
Ornamental Horticulture ......................................................... Howard C. Brown
Poultry Industry ..................................................................... Richard Leach
Soil Science ........................................................................... Logan Carter
Veterinary Science .................................................................. John Carter

ENGINEERING DIVISION

Aeronautical Engineering ......................................................... Charles P. Davis
Air Conditioning and Refrigeration Engineering ...................... James McGrath
Architectural Engineering ....................................................... George J. Hasslein
Electrical Engineering ........................................................... Fred W. Bowden
Electronic Engineering .......................................................... Clarence Radius
Industrial Engineering ............................................................. Millard J. Potter
Machine Shop .......................................................................... Francis F. Whiting
Mechanical Engineering ........................................................ Leon F. Osteyee
Welding and Metallurgical Engineering .................................... Richard C. Wiley

APPLIED ARTS DIVISION

Business Administration ........................................................... Walter P. Schroeder
Education ............................................................................. Philip L. Gerber
English and Speech .................................................................. Harold P. Davidson
Home Economics ...................................................................... Richard A. Anderson, Acting
Music ........................................................................................ A. M. Fellows
Physical Education .................................................................... J. M. McRobbie
Printing Engineering and Management ..................................... Robert V. McKnight
Technical Arts ........................................................................
Technical Journalism ................................................................

APPLIED SCIENCES DIVISION

Biological Sciences .................................................................... Glenn A. Noble
Mathematics ............................................................................ Milo E. Whiston
Military Science ....................................................................... Col. William M. Boyce
Physical Sciences .................................................................... Woodford E. Bowls
Social Sciences ......................................................................... Donald W. Hensel, Acting
KELLOGG CAMPUS
AGRICULTURE DIVISION

Agricultural Engineering ........................................ Haven Q. Conard
Agricultural Business Management ................................ William P. Rowley
Agricultural Services and Inspection ............................. Edward C. Appel, Jr.
Agronomy ...................................................................... Robert L. Procsal
Animal Science .......................................................... Harry B. McLachlin
Fruit Industries ......................................................... Albert E. Canham
Landscape Architecture ................................................ Howard O. Boltz
Ornamental Horticulture ............................................. Oliver A. Batcheller

ENGINEERING DIVISION

Aerospace Engineering ................................................ Rodney D. Sutherland, Acting
Civil Engineering ......................................................... Donald W. King
Electronic Engineering ................................................ Richard T. Black
Industrial Engineering ................................................ Joseph P. Wymer
Metal Processes .......................................................... Russell A. Parish
Mechanical Engineering ............................................... Walter E. Holtz
Welding ....................................................................... William M. Harris

ARTS AND SCIENCES DIVISION

Accountancy ................................................................ George E. Carlberg
Biological Sciences ....................................................... Jerome E. Dimitman
Business Management ................................................ Richard H. Schoning, Acting
Language Arts .............................................................. Ben Siegel
Marketing ..................................................................... Wallace A. Raab
Mathematics .................................................................. Lowell K. Weeks
Music .......................................................................... V. Barney Anooshian
Physical Education ....................................................... Elmer H. Rice
Physical Sciences ........................................................ Fernando Penalosa, Acting
Social Sciences .............................................................
THE STATE BUREAU OF AGRICULTURAL EDUCATION

State Director of Vocational Education, Wesley P. Smith

The State Bureau of Agricultural Education is a division of the State Department of Education. The bureau has charge of all vocational agriculture instruction in the State offered in public schools at the secondary level. Some of the bureau offices are located on the San Luis Obispo Campus, and the college and its staff participate actively in inservice training for vocational agriculture teachers.

Members of the bureau staff are well informed on activities of the college, and are always willing to discuss the college with prospective students. The State Bureau of Agricultural Education staff directory is listed below:

DIRECTORY STATE BUREAU OF AGRICULTURAL EDUCATION

B. J. McMahon, Chief of Bureau
Room 413, State Education Bldg., Sacramento 95814

E. D. Graf, Jr., Asst. Chief of Bureau
Room 413, State Education Bldg., Sacramento 95814

K. B. Cutler, Regional Supervisor
809-C California State Bldg., 217 W. First St., Los Angeles 90012

S. L. Barrett, Regional Supervisor
Room 413, State Education Bldg., Sacramento 95814

Donald Wilson, Regional Supervisor
California State Polytechnic College, San Luis Obispo 93402

W. J. Maynard, Regional Supervisor
809-C California State Bldg., 217 W. First St., Los Angeles 90012

R. H. Pedersen, Regional Supervisor
Room 4064, 1111 Jackson St., Oakland 94607

G. A. Hutchings, Regional Supervisor
Room 8044, State Bldg., 2550 Mariposa St., Fresno 93721

J. E. Walker, Regional Supervisor
47 Warner Street, Chico 95928

H. H. Burlingham, Teacher Trainer
California State Polytechnic College, San Luis Obispo 93402

S. S. Sutherland, Teacher Trainer
University of California, College of Agriculture, Davis 95616

George P. Couper, Special Supervisor
California State Polytechnic College, San Luis Obispo 93402
FACULTY

(Number in parentheses indicates year of appointment)
Listed as of January, 1964

McPHEE, JULIAN A. (1933) ............................................ President
B.S., University of California, 1917; M.A., 1928; LL.D., Armstrong College, 1952.
Experience: Agriculture Extension Service, University of California; U.S. Navy;
director of vocational agriculture, El Dorado County High School and Gilroy
Union High School; chief, Bureau of Agricultural Education, State Department of
Education (California); director, War Food Production Training Program for
California; acting chief, Bureau of Readjustment Education; assistant executive
officer, State Board of Vocational Education; state director, Vocational Education
(California).

* ABU-HAYDAR, LAURE (1960) ...................................... Mathematics
A.B., American University, Beirut, Lebanon, 1949; Mathematiques, Generales,
University of Lyon, 1951; M.A., University of Southern California, 1956; additional
graduate study, University of Southern California.
Experience: Lecturer, University of Southern California

ACKERMAN, CHARLES D. (1963) ......................... Electronic Engineering
Experience: Research assistant, Montana State College; computer engineer, Auto-
netics; control systems engineer, IBM.

* ADAIR, VIRGINIA H. (1957) .................................. English
B.A., Mount Holyoke College, 1933; M.A., Radcliffe College, 1936; additional
graduate work, University of Wisconsin, University of Washington, Claremont
Graduate School.
Experience: Teaching fellow, University of Wisconsin; librarian and bibli-
otherapist; instructor, College of William and Mary, Pomona College, La View
College.

ADAMSON, ROBERT W. (1953) ................................. Mechanical Engineering
B.S., Ch.E., Tulane University, 1941; M.S., Ch.E., Oregon State College, 1948.
Experience: Petroleum refinery engineer, Standard Oil Company of New Jersey;
instructor, mechanical engineering, Oregon State College; research assistant, indus-
trial sales engineer, Union Oil Company of California. Registered professional engi-
neer, California.

* ALBERTI, ROBERT E. (1963) .......................... Assistant to the Vice President
B.S., California State Polytechnic College, San Luis Obispo, 1959; M.A., Los
Angeles State College, 1962; additional graduate study, University of California at
Los Angeles, Arizona State University.
Experience: Program director, Memorial Union, Arizona State University; co-
ordinator of student activities, Los Angeles State College; research technician,
University of California at Los Angeles.

ALEXANDER, WILLIAM M. (1958) ......................... Social Sciences
B.S., Oregon State College, 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.
Experience: Management assistant, U.S. Geological Survey; teaching fellow, Uni-
versity of Oregon; instructor, Oregon State College.

* Kellogg-Voorhis staff.
ALLEN, JOHN K. (1952) ......................................................... Veterinary Science
D.V.M., Iowa State College, 1934.

ALLEN, RAY (1955) .......................................................... Welding
B.A., Santa Barbara State College, 1942; graduate study, Santa Barbara State College.
Experience: Instructor, U.S. Naval Air Technical Training Center; technician, U.S. Air Force; instrument technician, welder, and machinist, self-employed; welder, Ventura Coastal Lemon Co.; engineer, Carpinteria Fire District.

AMATO, ANTHONY J. (1955) ................................................ Ornamental Horticulture
B.S., California State Polytechnic College, 1949; graduate study, California State Polytechnic College.
Experience: Instructor, Mt. San Antonio Junior College, Pomona; Oakland Junior College; landscape architect and contractor, Walnut Creek, California; officer, U.S. Air Force.

AMES, RALPH W. (1961) ..................................................... Biological Sciences
B.S., University of Wyoming, 1941; M.S., 1942; Ph.D., University of Illinois, 1950.
Experience: Assistance plant pathologist, Waltham Field Station; associate professor of botany and plant pathology, Utah State Agricultural College; professor and head department of botany and plant pathology, Utah State University; plant pathologist, Los Angeles State and County Arboretum, J. Harold Mitchell Company.

ANDERSEN, OLIVE M. (1958) ............................................... Mathematics
Experience: Teacher, Sanees European High School, Coonoor, India; Baldwin Girls' High School, Bangalore, India.

ANDERSON, ELIZABETH B. (1958) ........................................ English
B.S., Ohio University, 1938; M.A., California State Polytechnic College, 1959.

ANDERSON, KENNETH H. (1963) .......................................... Physical Sciences
B.S., Brigham Young University, 1953; M.S., 1955; Ph.D., University of Southern California, 1963.
Experience: U.S. Army; instructor, South Dakota School of Mines and Technology; guest professor, Brigham Young University; instructor, Bakersfield College; teaching assistant, University of Southern California; assistant professor, Los Angeles State College; research associate, University of Southern California.

ANDERSON, PAUL B. (1956) ................................................ English
B.A., University of Minnesota, 1925; M.A., Harvard University, 1927; Ph.D., 1931; additional graduate study, University of Chicago, Ohio State University, University of California, Danforth seminars, Pacific School of Religion and Claremont College.
Experience: Instructor, Massachusetts State College; professor, Parsons College, Tusculum College; professor, director of debate, academic dean, Otterbein College; professor, academic dean, National College.

Kellogg-University staff.
ANDERSON, RICHARD A. (1947) Acting Head, Physical Education Department
B.S., University of Southern California, 1942; M.S., 1947; additional graduate study, University of California at Los Angeles.
Experience: Playground director, Los Angeles Playground and Recreation Department; officer, U.S. Navy; swimming pool director, South Pasadena; assistant instructor in physical education and assistant swimming coach, University of Southern California.

ANDERSON, ROY E. (1949) Business Administration
Experience: Assistant manager, Hancock Oil Company, Tacoma, Washington; teacher, Parkland and Tacoma, Washington, public schools systems; officer, U.S. Army; instructor, Monterey Peninsula College, Monterey, California; National Park ranger; dean, arts and sciences division, California State Polytechnic College.

ANDERSON, RYLO E. (1955) Animal Husbandry
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956.
Experience: U.S. Air Force; instructor, Animal Husbandry Department, Iowa State University.

ANDERSON, WARREN R. (1946) Electrical Engineering
B.S., University of Minnesota, 1939; B.S., Louisiana State University, 1944; graduate study, Central Signal Corps School, Camp Crowder, Missouri.

ANDREINI, ROBERT L. (1954) English and Speech
B.A., Stanford University, 1941; M.A., 1949; additional graduate study, University of California, Berkeley.
Experience: U.S. Air Force; instructor in English and speech in California high schools; real estate promotion in San Mateo, California.

ANDREOLI, ALFRED E. (1963) Aeronautical Engineering
B.S., University of Colorado, 1954; M.S., California Institute of Technology, 1956; additional graduate study, University of Colorado.
Experience: Test engineer, aerodynamicist, Northrop Aircraft; assistant professor, Los Angeles State College; teaching associate, University of Colorado.

ANDRESEN, JAMES G. (1956) Mechanical Engineering
B.S., California State Polytechnic College, 1956.
Experience: U.S. Army.

ANDREWS, DALE W. (1950) Dean of the College
B.S., University of California, Davis, 1941; M.A., California State Polytechnic College, 1952; Ph.D., University of Minnesota, 1957.
Experience: Director of agriculture and supervising teacher, Merced Union High School; director of agriculture and supervising teacher, Arroyo Grande Union High School, Arroyo Grande; officer, U.S. Marine Corps; agricultural teacher trainer, instructional materials coordinator, and special educational services coordinator, California State Polytechnic College; senior Danforth associate.

*ANOOSHIAN, V. BARNEY (1958) Head, Physical Education Department
A.B., San Jose State College, 1947; M.A., Claremont Graduate School, 1961; additional graduate study, San Jose State College, Stanford University, University of Nevada.
Experience: Instructor, Summerville High School, Tuolumne County; coach and instructor, Modesto High School.

* Kellogg-Voorhis staff.
APPÉL, EDWARD CARL, JR. (1946) Head, Agricultural Services and Inspection Department

B.S., Oregon State College, 1940.
Experience: Agricultural inspector and deputy county agricultural commissioner, Department of Agriculture, San Bernardino County; officer, U.S. Navy.

APPLEGARTH, JOHN H. (1952) Biological Sciences
A.B., San Jose State College, 1935; M.A., Stanford University, 1938; additional graduate study, University of Maryland.
Experience: Instructor, San Jose State College; Bureau of Plant Quarantine and Entomology; ranger-naturalist, Sequoia National Park; commodity expert, drug and miscellaneous plants, U.S. Tariff Commission, Chemical Division, Washington, D.C.; assistant professor, University of Maryland.

ARMENTROUT, WILLIAM W. (1953) Coordinator, Secondary Education
B.S., University of Missouri, 1939; A.B., Colorado State College of Education, 1940; M.A., Columbia University, 1940; Ed.D., Stanford University, 1953.
Experience: Guidance counselor, Menlo School and College; personnel classification officer and personnel consultant, U.S. Air Force; associate registrar, Stanford University; test officer and instructor in education, California State Polytechnic College.

ARMSTRONG, WILLIAM W., JR. (1960) Fruit Industries
B.S., California State Polytechnic College, 1958.
Experience: Horticulturist, USDA, Indio; citrus orchard manager, Indio; vineyardist, Indio.

ASCHENBRENNER, ALBERT J. (1947) Associate Dean (Counseling and Testing)
A.B., Whitman College, 1940; M.S., University of Southern California, 1947; Ed.D., 1961.
Experience: Custer County High School, Miles City, Montana; Infantry School, Fort Benning, Georgia. Instructor, English and social sciences; registrar and admissions officer, Kellogg Campus, California State Polytechnic College.

BABB, JAMES H. (1959) Printing Engineering and Management
Experience: Fifteen years experience in printing, 6½ of which was as owner of Visalia Printing Service.

BAILEY, ROGER S. (1962) Education
B.A., Allegheny College, 1949; M.A., State University of Iowa, 1951.
Experience: Supervising teacher, State University of Iowa; art instructor, Coronado High School and La Mesa Junior High School; art supervisor, Escondido Union School District; instructor in art education, University of California Extension; Palomar Junior College and Pacific Lutheran University, Washington.

BANDES, WILLIAM D. (1958) Mathematics
B.S., North Carolina State College, 1952; M.S., Bucknell University, 1958.
Experience: Textile engineer; teaching assistant, Bucknell University; U.S. Army Research and Development.

BARR, STANLEY L. (1959) English
B.A., St. Bernardine of Siena College, 1953; M.A., University of Michigan, 1955; additional graduate study, University of Wisconsin, Harvard University, University of Oregon.
Experience: Teacher, Michigan Public Schools; assistant professor, Lakeland College; instructor, Wisconsin State College.

BARRETT, ROBERT (1963) Biological Sciences
B.A., University of California, 1934; graduate study, University of California.
Experience: Instructor, Harvard University; U.S. Army; self-employed farming.

* Kellogg-Voorhis staff.
BATHCHELLER, OLIVER A. (1946) Head, Ornamental Horticulture Department
B.S., Oregon State College, 1936; graduate study, Oregon State College.
Experience: Assistant farm adviser, Oregon; branch manager, California Nursery Company; officer, U.S. Army.

BAUER, GEORGE C. (1958) Mechanical Engineering
M.E., Cornell University, 1925.
Experience: Mechanical engineer, U. C. Radiation Laboratory; mechanical design engineer, Aerojet General Corporation and Westinghouse Electric Corporation; administration and instruction, Engineering School, Curtiss Wright Technical Institute; design engineer at various aircraft companies; registered professional engineer, California.

BAUM, JOHN M. (1963) Music
B.S., University of New Mexico, 1950.
Experience: Music instructor, Atascadero Union High School; Torrance Unified School District; Grants Unified School District, New Mexico.

BEARDMORE, ROBERT L. (1958) Mechanical Engineering
B.S.M.E., 1951; M.S.M.E., 1952, University of Illinois.

BEATIE, GEORGE C. (1959) Coordinator of Special Services
A.B., University of California at Santa Barbara, 1949; M.A., California State Polytechnic College, 1956; additional graduate study, University of California at Santa Barbara, Northwestern University.
Experience: Assistant instructor, University of California at Santa Barbara; music director, USNR, University of Rochester, New York; teacher, Nipomo Elementary School, Oceano Elementary School, Arroyo Grande Union High School; director, student activities, Arroyo Grande Union School; band director, California State Polytechnic College, San Luis Obispo.

BELCHER, MELVIN B. (1958) Electronic Engineering
B.S.E.E., 1951, University of California, Berkeley.
Experience: Test engineer, analytical engineer, manager Southern Nevada Area, General Electric, Schenectady, and Las Vegas, Nevada; service engineer, Western Audiograph, Los Angeles.

BELLMANN, SAMUEL I. (1957) Language Arts
B.A., University of Texas, 1947; M.A., Wayne University, 1951; Ph.D., Ohio State University, 1955.
Experience: Assistant instructor and university fellow, Ohio State University; columnist, the Fresno Guide. Instructor: Fresno State College; California State Polytechnic College, San Luis Obispo; San Luis Obispo Adult School; University of California Extension, Los Angeles.

BENNION, LYMAN L. (1938) Head, Animal Husbandry Department
B.S., Utah State College, 1929.
Experience: Sales Department, Purina Mills; American Packing Company, Union Stockyards, Ogden, Utah; agriculture instructor, Salinas Union High School, agricultural extension service, University of California.

BERGHELL, JOY GARRISON (1956) Library
B. of Journalism, University of Missouri, 1935.
Experience: Copywriter, public relations and promotion, Los Angeles Times; account executive, R. W. Webster Advertising, Los Angeles; editorial writer, Southwestern Signal Corps Training Center, San Luis Obispo; free-lance advertising, publicity and newspaper writer.

* Kellogg-Voorhis staff.
BERNE, JOHN R. (1960) .......................... Housing Coordinator
B.S., University of Southern California, 1958; graduate study, University of Southern California.
Experience: Counselor of men's organizations, University of Southern California.

BETZ, ELLARD W. (1947) .......................... Machine Shop
B.A., Santa Barbara State College, 1942.
Experience: U.S. Navy; teacher, Victorville, California.

BILLE, RALPH O. (1948) .......................... Agricultural Engineering
B.S., University of Minnesota, 1922; M.S., 1940.
Experience: Agriculture instructor in secondary schools, Minnesota; agricultural engineering and industrial arts instructor, State Teachers College, Platteville, Wisconsin.

BIRKETT, RICHARD J. (1955) ......................... Animal Husbandry
B.S., California State Polytechnic College, 1953, graduate study.
Experience: Feed and milking supervision, Union Stock Farms, Blythe, California.

BISHOP, CHESTER O. (1957) ........................ Mechanical Engineering
B.S., McPherson College, 1929; M.S., Texas A&M College, 1955.
Experience: Professor, Arkansas Tech; Hind Junior College, Raymond, Mississippi; instructor, San Angelo College, Texas; Copiah-Lincoln Junior College, Wesson, Mississippi; Texas A&M Radar School; engineer and manager, B & M Machine Co., Grenada, Mississippi.

BLACK, RICHARD T. (1960) ........................ Head, Electronic Engineering Department
B.S.E.E., U.S. Naval Academy, 1933; certificates, Harvard Graduate School of Engineering and Massachusetts Institute of Technology.
Experience: Communications—electronics engineer officer, USAF; command of Air Force Proving Ground Electronics Unit, Elgin Air Force Base.

BLAIR, FOREST E. (1960) .......................... Civil Engineering
B.C.E., Cornell University, 1951.

BLAKELY, LAWRENCE M. (1963) ..................... Biological Sciences
B.A., Montana State University, 1956; M.A., 1958; Ph.D., Cornell University, 1963.
Experience: Graduate assistant, Montana State University; teaching and research assistant, research associate and instructor, Cornell University.

BLINKHERN, LOUISE (1955) ........................ Library
B.A., University of California, Los Angeles, 1929; Certificate in Librarianship, University of California, 1931.
Experience: Librarian, San Marino Public Library, San Marino; cataloger and audio-visual assistant, Arcadia Unified School District, Arcadia.

BLOOM, EMMETT A. (1946) ........................ Animal Husbandry
B.S., University of California, Davis, 1934.
Experience: Agricultural instructor at Ripon, Laton, and Corning High Schools.

BOBB, SYDNEY RALPH (1958) ....................... English
A.B., 1939, University of Chicago, M.A., 1948; Ph.D., Stanford University, 1954.
Experience: U.S. Army; instructor, Washington State College; acting instructor, Stanford University; instructor, California State Polytechnic College, San Luis Obispo.

Kellogg-Voorhis staff.
BOGUE, CAMERON C. (1955) .................................................. Mathematics
B.A., University of Redlands, 1943; M.A., University of Michigan, 1947; additional
graduate study, North Carolina State College.
Experience: Occidental Life Insurance Company, Los Angeles; instructor, Eliot
Junior High School, Altadena.

BOLAND, GERTRUDE C. (1957) ......................................... Social Sciences
A.B., Mt. St. Mary's College, 1936; B.S., Georgetown University, 1948; M.A.,
Catholic University of America, 1950; Ph.D., Claremont University College, 1961.
Experience: Elementary teacher, Los Angeles City Schools; U.S. Navy; instructor,
Manhattanville College of the Sacred Heart; senior statistician and group leader,
Aerojet-General Corporation.

BOLTZ, HOWARD O. (1947) ...... Head, Landscape Architecture Department
B.S., University of California, 1941; M.S., 1947.
Experience: Landscape architect in private practice; officer, U.S. Army.

BONGIO, ENRICO P. (1948) .................................................. Welding
A.B., Chico State College, 1948.
Experience: Welder, Chicago Bridge and Iron Company; U.S. Army; welder and
shop maintenance, Churchill Frozen Foods Company, Eureka, California; general
metal shop work, Woodsman Power Saw Company, Eureka; welder, Eureka Boiler
Works and Steel Products; shop instructor, Sonoma Valley Union High School,
Sonoma, California; metals inspector, Hunter's Point Naval Shipyard, San Francisco.

BOOTHE, ROBERT O. (1954) .................. English
B.A., University of Wisconsin, 1950; M.A., Los Angeles State College, 1953;
additional graduate study, University of California at Los Angeles, Los Angeles
State College, University of Michigan and Mexico City College.
Experience: Instructor, El Camino College; instructor, Compton College; freelance
journalist and photographer; toolmaker, tool designer, and engineer.

BOSTROM, ROBERT M. (1956) .................. Housing Coordinator
B.S., California State Polytechnic College, 1956.
Experience: Graduate manager, California State Polytechnic College.

BOTOND-BLAZEK, JOSEPH (1961) .................. Social Sciences
B.A., University of California at Los Angeles, 1956.
Experience: Teaching assistant, U.C.L.A.; associate in humanities, University of
California at Riverside.

BOWDEN, FREDERICK W. (1949) ............ Head, Electrical Engineering Department
B.S., California Institute of Technology, 1932; M.S., 1933; additional graduate
study, California Institute of Technology.
Experience: Geophysics, Shell Oil Company; electrical engineer, Oilfields Service
Co.; mechanical and electrical consultant, Walt Disney Enterprises; head electrical
research department, Lockheed Aircraft Corp.; associate professor, University of
Southern California College of Aeronautics. Registered professional engineer, Cali-
fornia.

BOWLS, WOODFORD E. (1937) ............. Head, Physical Sciences Department
A.B., University of California, 1932; M.A., 1935; Ph.D., 1937.
Experience: Teaching assistant and teaching fellow in physics, University of
California.

BOWMAN, ERNA (1962) .................. Education
M.F.A., Otis Art Institute, Los Angeles, 1961.
Experience: Instructing designer, Foremost Studio, New York City; Headon
Designers, London and Manchester, England; owner and operator of commercial
design studio, Montreal, Canada; freelance designer, Los Angeles; fine arts instruc-
tor, private schools, art associations, Los Angeles.

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B.S., University of Connecticut, 1938; graduate work at George Washington University; graduate Command and General Staff College, 1945; Special Weapons Officer Course, 1955.

Experience: Infantry platoon leader, battalion commander and deputy battle group commander; instructor and committee chairman, U.S. Army Infantry School, Ft. Benning, Georgia; inspector general; member of Department of the Army general staff and the joint staff of the Joint Chiefs of Staff, Washington, D.C.

BOYLE, KENNETH D. (1947) Dairy Manufacturing
B.S., University of Minnesota, 1942.
Experience: Butter and ice cream, Neepawa Creamery and Produce Co., Neepawa, Manitoba, and Central Creameries, Brandon, Manitoba; Royal Canadian Air Force; research staff and foreman in experimental plant, Golden State Co., Ltd., San Francisco.

BRANNUM, THOMAS P. (1952) Animal Husbandry
B.S., California State Polytechnic College, 1948.
Experience: Dos Pueblos Ranch, Goleta; U.S. Army Air Force; agriculture instructor, Santa Ynez High School.

BRECKAN, ERLING A. (1958) Business
B.S., University of Illinois, 1941; M.B.A., University of California at Los Angeles, 1952.
Experience: Officer, U.S. Army; lecturer, University of California at Los Angeles; assistant to plant manager, Neomatie, Inc.

BRENDLIN, GENE E. (1950) Foundation Manager
B.S., University of California, 1934.
Experience: Director, vocational agriculture, Fallbrook Union High School, Linden Union High School, Tracy Union High School, and Arroyo Grande Union High School; farmer, San Luis Obispo County.


BROMLEY, J. PHILIP (1947) Farm Management
B.S., University of Southern California, 1934; M.S., 1936; additional graduate study, Columbia, Texas A & M, and University of California.
Experience: Teacher, Garvey School District; instructor, San Diego State College; officer, U. S. Navy.

* BROWN, DONALD E. (1958) Metal Processes
Mount San Antonio College: University of California at Los Angeles; Los Angeles State College.
Experience: General machinist, H. W. Loud, Pomona; experimental machinist, Glenn Jones Machinists, Ontario, California.

* BROWN, HARRY M. (1963) Language Arts
Experience: Instructor, Baldwin-Wallace College; teaching fellow, Western Reserve University; assistant professor, Shepherd College; associate professor, Louisiana Polytechnic Institute.

BROWN, HOWARD C. (1946) Head, Ornamental Horticulture Department
B.S., California State Polytechnic College, 1943; M.S., Ohio State University, 1954; Ph.D., 1963.
Experience: U.S. Army Air Force; instructor, Ohio State University.
BROWN, HOWARD S. (1948) Biological Sciences
B.A., University of California at Los Angeles, 1943; M.A., 1949; Ph.D., Claremont Graduate School, 1960.
Experience: Visiting professor, Chung Chi College, Hong Kong; officer, U.S. Marine Corps.

BROWN, WILLIAM H. (1957) Architectural Engineering
B.Arch., University of Florida, 1954; graduate study, University of Florida.

BROWNE, PHILIP (1963) Music
Experience: Music teacher, elementary, junior high and high schools; musician, Phoenix Symphony, Eastman Wind Ensemble; arranger, King Arranging Association, Chicago, Crawley Film Corporation, Ottawa; composer, performances in Europe (International Music Educators' Convention) and United States including Eastman-Rochester Symphony Orchestra, Howard Hanson.

BRUNK, ATHOL J. D. (1957) Physical Sciences
B.S., Northwestern State Teachers College, 1937; M.A., West Texas State Teachers College, 1941.
Experience: Instructor in mathematics and science, high school, Beaver, Oklahoma; elementary principal, Alamogordo, New Mexico; officer, U.S. Navy; mathematics instructor, Atascadero, California.

BRYSON, PAUL R. (1956) Physical Sciences
A.B., Pacific Union College, 1941; M.A., University of Southern California, 1949; additional graduate study, University of Southern California.
Experience: Instructor and administrator, California College of Medical Technicians; instructor in physics, Reedley High School and College.

BUCCOLA, VICTOR A. (1962) Physical Education
B.S., California State Polytechnic College, 1956; M.A., 1957.
Experience: Officer, U.S. Army; physical education instructor and athletic coach, The College of Idaho; science and math instructor and athletic coach, Mark Keppel High School.

BUCICH, RICHARD A. (1963) Electronic Engineering
Experience: Sub-station operator, electrical engineer, U.S. Steel Corporation; graduate assistant. Illinois Institute of Technology; assistant professor, Purdue University Center.

BUCY, L. LAVERNE (1955) Animal Husbandry
B.S., University of Kentucky, 1943; M.S., 1950; Ph.D., University of Illinois, 1954.
Experience: Graduate assistant in animal science, University of Illinois; teacher of vocational agriculture, Kentucky high schools; farming; U.S. Navy.

BURDICK, THOMAS A. (1962) Public Relations Coordinator
B.A., M.A., Long Beach State College; additional graduate study, University of California at Los Angeles, Los Angeles State College.
Experience: Editorial departments Pasadena Star-News, Alhambra Post-Advocate, Long Beach Independent Press-Telegram newspapers; teacher, English and journalism, Garden Grove High School District; administrative assistant, public relations, Orange Coast College; public relations coordinator, Long Beach State College; supervisor of publications, Alhambra Elementary and High School Districts.

* Kellogg-Voorhis staff.
BURFLBACH, FREDERICK M., JR. (1963) English and Speech
A.B., Haverford College, 1956; A.M., University of Michigan, 1957; additional graduate study, Harvard University.
Experience: Grader, University of Michigan; teaching fellow, freshman advisor, dormitory proctor, Harvard University; instructor, Georgetown University.

BURGESS, THOMAS G. (1963) Mathematics
Experience: Engineer, Radio KDSH; chief engineer and announcer, Radio KCID, Caldwell, Idaho; student assistant, assistant instructor, instructor, Idaho State College; instructor, Colorado State University.

BURLINGHAM, HERBERT H. (1948) Chairman, Agricultural Education
B.S., Oregon State College, 1929; graduate study, University of California.
Experience: Executive student, Swift and Company; director of agriculture, Willits Junior-Senior High School; director of agriculture and critic teacher, Madera Union High School, Paso Robles Union High School; regional supervisor, State Bureau of Agricultural Education, California.

BUSCHMAN, WILLIAM O. (1956) Mathematics
A.B., Reed College, 1941; M.Ed., University of Oregon, 1947; Ed.D., Oregon State College, 1953.
Experience: Marine engineering and naval architecture, Kaiser Co., and others; teaching, Portland Public Schools, Gresham Union High School; instructor, Multnomah College; assistant professor, Oregon State System of Higher Education, General Extension Division; assistant professor, Portland State College; research, University of Oregon Medical School, Stanford Research Institute, and Institute for Motivational Research.

* BUTTERWORTH, JOHN R. (1961) English
B.A., Syracuse University, 1933; M.A., University of Southern California, 1938; Ph.D., University of California at Los Angeles, 1959.
Experience: Instructor in English, University of Nevada; assistant professor of science (USAF), University of Southern California; staff officer, U.S. Air Force.

BUTZBACH, ARTHUR G. (1950) Education and Co-ordinator of Graduate Studies
A.B., Stanford University, 1926; M.A., 1929; Ed.D., 1948.
Experience: Teacher and principal, Lower Lake Union High School; assistant professor of education, Drake University and Sacramento State College.

CALI, TRACEY G. (1962) Biological Sciences
B.S., Idaho State College, 1940; M.S., University of Maryland, 1944; A.B., Brigham Young University, 1947; Ph.D., University of Minnesota, 1956.
Experience: Teaching Assistant, Idaho State College; Teaching Assistant, University of Washington; Teaching Assistant, University of Maryland; Drug Store Manager, Afton, Wyoming; Assistant Professor, Duquesne University; Assistant Professor, University of Wyoming; Associate Professor, Montana State University; Research Pharmacologist, Sunkist Growers, Inc.; Project Director-Consultant, W.L.R.I., Holland-Rantos Youngs Rubber Corporation.

* CANHAM, ALBERT F. (1948) Head, Fruit Industries Department
B.S., University of California at Los Angeles, 1941.
Experience: Officer, U.S. Navy; manager of avocado and citrus orchards; owner and operator of commercial weed and pest control company; instructor in I-on-F program, Palomar College, Vista, California.

Kellogg-Voorhis staff.
CARLBERG, GEORGE E. (1949) Head, Accountancy Department
B.S., University of California, 1947; graduate study, University of California at Los Angeles and Claremont Graduate School.

CARLSTEDT, GEORGE C. (1959) Mathematics
B.S., U.S. Coast Guard Academy, 1924; M.S., Purdue University, 1958.
Experience: Instructor, Bradley University; Line Officer, U.S. Coast Guard; District Commander; Commanding Officer, Curtis Bay Training Station.

CARR, LAURENCE H. (1963) Physical Sciences
B.S., University of Chicago, 1932; M.S., 1934.
Experience: Director of research and engineering, Edward Valves, Inc.; lecturer and assistant professor, Purdue University.

CARRINGTON, JAMES H. (1943) Agricultural Engineering
Special Vocational Arts Credential, University of California, Los Angeles, 1940; University of California, Berkeley, 1941 and 1942.
Experience: Auto mechanic, Los Molinos Garage, Los Molinos; auto shop instructor; Los Molinos High School, Los Molinos.

CARROLL, KENNETH L. (1963) Physical Sciences
B.S., California State Polytechnic College, 1961; graduate study, California State Polytechnic College.
Experience: Technical assistant, California State Polytechnic College; U.S. Army.

CARSON, GEORGE W. (1961) Mathematics
A.B., Hanover College, 1927; M.A., University of Illinois, 1935; additional graduate study, University of Pittsburgh; Stanford University.
Experience: Public schools; Pikeville College; professor of mathematics, Grove City College; associate professor of mathematics, University of Redlands.

CARTER, LOGAN SAMPSON (1947) Head, Soil Science Department
B.S., Oregon State College, 1930; Ph.D., Michigan State College, 1934.
Experience: Instructor, Michigan State College; U.S. Department of Soil Conservation; Bureau of Reclamation, U.S. Department of Interior, Washington, D.C.

CASS, MARJORIE (1957) Education
B.S., University of Nebraska, 1932; M.A., Columbia University, 1945; additional graduate study, University of Missouri, 1947.
Experience: Teacher, Nebraska and Iowa; instructor, Stephens College; assistant professor, Grinnell College.

CATALINA, FRANCIS V. (1962) Mathematics
A.B., San Jose State College, 1950; M.A., University of Southern California, 1952; Ph.D., American Academy of Asian Studies, Affiliate of the College of the Pacific, 1959; additional graduate study, University of California, San Francisco State College, College of the Holy Names.
Experience: Laboratory assistant, Garan Chemical Company; instructor, San Jose Adult Education School; instructor, Soledad State Prison. Teacher: Granda Junior High School, George Washington High School, McClymonds High School, Oakland City College.

CHANDLER, EVERETT M. (1951) Dean of Students
A.B., University of California, 1939; graduate study, University of California.
CHANG, YU (1963)  
Mathematics  
B.A., Sacramento State College, 1961; M.A., University of California at Davis, 1963; additional graduate study, University of California at Davis.  
Experience: Teaching assistant, University of California, Davis; programmer, Computer Center, University of California, Davis.

CHASE, Daniel C. (1954)  
Head, Agricultural Business Management Department  
Experience: Teacher of vocational agriculture, veterans' instructor, Tolleson Union High School, Tolleson, Arizona; supervising teacher, University of Arizona; veterans' co-ordinating teacher, State Department of Vocational Education, Phoenix, Arizona; farm editor and columnist, Arizona Republic; assistant professor and head, division of farm management, Arizona State College, Tempe, Arizona.

CHIZEK, GAYLORD J. (1958)  
Farm Management  
B.S., Kansas State College, 1957; M.S., 1958.  
Experience: Assistant instructor, Kansas State College, Manhattan, Kansas; farmer; U.S. Army.

CHORNEY, ALEXANDER H. (1962)  
Language Arts  
A.B., University of California at Los Angeles, 1948; M.A., 1951; Ph.D., 1963.  
Experience: Teaching assistant, University of California at Los Angeles; instructor and assistant professor, University of Southern California; William Andrews Clark Memorial Library fellow; radio, music experience.

CHOU, TEH-LOH (1961)  
Electronic Engineering  
B.S., Chinese National Chekiang University, 1947; M.S., University of Washington, 1956; U.S. Signal Corps Officers Advanced Course, Fort Monmouth, N.J.  
Experience: Associate professor, Institute of Electronics, National Chiotung University, Taiwan; senior engineer, Sverdrup-Parcel, San Francisco; research assistant, University of Washington; instructor, Chinese Army Signal School, Taiwan.

* CHURCH, DAVID A. (1962)  
Language Arts  
B.A., Los Angeles State College, 1959; M.A., 1961; additional graduate study, University of Southern California.  
Experience: Graduate assistant, Los Angeles State College, University of Southern California; teacher, Los Angeles City Schools; lecturer, Loyola University; instructor, Los Angeles State College.

CLINNICK, MANSFIELD L. (1960)  
Mathematics  
Experience: Artillery officer, U.S. Marine Corps; Instructor, California State Polytechnic College; Computer, University of California Radiation Laboratory, Berkeley; Senior Programmer, Lawrence Radiation Laboratory, Livermore; Computer Project Manager, Broadcom Research Corporation, Burlington, California.

CLOGSTON, FRED L. (1960)  
Biological Sciences  
B.A., B.S., Western Washington College, 1950; M.S., University of Washington, 1956; further graduate study, University of Washington.  
Experience: Instructor, public schools; teaching and research assistant, University of Washington; research associate, Office of Naval Research; instructor, Western Washington College; associate, University of California at Santa Barbara.

CLOONAN, CLIFFORD B. (1957)  
Electronic Engineering  
Experience: Instructor, U.S. Army Signal Corps; physical science aide, National Bureau of Standards, Boulder, Colorado; systems design engineer, Collins Radio Company, Cedar Rapids, Iowa; research associate and research assistant, Electronic Research Laboratory, Montana State College; consultant, McDonnell Aircraft Company, St. Louis, Missouri; microwave engineer, Hewlett-Packard Company, Palo Alto.

* Kellogg-Voorhis staff.
* COCHRAN, DOROTHY B. (1959) Placement Supervisor
B.A., Emporia State College, 1931.
Experience: Placement Secretary, Claremont Graduate School; Director of Placement, Claremont Men's College.

* COCHRANE, KENNETH H. (1963) Physical Education
B.A., San Diego State College, 1959; graduate study, San Diego State College.
Experience: U.S. Navy; graduate assistant, San Diego State College; teacher and coach, Lincoln High School and Helix High School, San Diego.

COCKRIEL, GEORGE W. (1957) Industrial Engineering
Experience: Chief, Pacific Fire District, Sacramento; special agent, U.S. Army counterintelligence; investigator, office of the District Attorney, Reno, Nevada; instructor, fire safety and control, California Highway Patrol Academy, Sacramento.

* COLE, DAVID E. (1962) Agricultural Business Management
B.S., California State Polytechnic College, 1952.
Experience: Produce Broker, Patterson; General Manager, Santa Lucia Tomato Growers Co-op; General Manager, Nutting and Hogue; District Manager, American National Foods, Inc.; Nurseryman, Monterey Park Nursery; Salesman, Standard Stations, Inc.

COLLINS, RALPH C. (1955) Education
B.S., Drake University, 1932; M.A., 1941; Ed.D., University of Colorado, 1951.
Experience: Officer and navigation instructor, U.S. Navy; physics instructor, East High School, Des Moines, Iowa; graduate assistant, Iowa State College and University of Colorado; head, Science Department, Eugene High School, Eugene, Oregon; assistant professor, Central Washington College of Education, Drake University, University of Oregon.

COLLINS, SPELMAN B. (1939) Animal Husbandry
B.S., University of California, 1925.
Experience: Agriculture instructor, Middletown, Calistoga, and Livermore high schools.

* COMER, JOHN W. (1962) Civil Engineering
B.S., Oklahoma State University, 1935; M.S., 1950.
Experience: Associate Professor, Oklahoma State University; Inspector, Bureau of Reclamation; Field Engineer, Atlantic Refining Company; Officer, U.S. Army Transportation Corps; Registered Professional Engineer, Oklahoma.

COMPTON, MEL D. (1958) Welding
University of Southern California, University of California at Los Angeles.
Experience: Welder and teacher in apprentice program, Standard Oil Company; instructor in welding, Compton College and El Camino College.

* CONARD, HAVEN Q. (1946) Chairman, Agricultural Engineering
B.S., Iowa State College, 1943.
Experience: Teaching, Engineering Drafting Department, Iowa State College; officer, U.S. Air Force.

CONNER, E. WESLEY (1963) Ornamental Horticulture
B.S., California State Polytechnic College, 1956.
Experience: Manager, Landscape Department, Yosemite Park & Curry Company; landscape consultant, Spencer & Lee, Architects, San Diego and Napa County; assistant to landscape architect, Huettig & Schromm, Palo Alto.

COOK, DAVID W. (1941) Curriculum Evaluator
B.S., University of California, 1937.
Experience: Examiner, Board of Fire Underwriters of the Pacific; engineer, Insurance Company of North America; instructor, electrical engineering and mathematics; coordinator of navigation instruction, U.S. Naval Flight Preparatory School; registrar; chairman, Mathematics Department, California State Polytechnic College.

* Kellogg-Voorhis staff.
COOK, EDWARD P. (1958) ................................................................. Welding
Special courses, Burbank Technical Institute, 1942, Frank Wiggins Trade School, 1936.
Experience: Supervisor, California Stamping Manufacturing; welder, Beckman Instruments; weld supervisor, Master Products Company, Precision Sheet Metal, and Lockheed Aircraft Company; shop foreman, Howell Manufacturing Company; welder, Webber Store Fixtures and Barker Brothers.

COTNER, DONALD L. (1960) ......................................................... Architectural Engineering
B.Arch., 1947; M.S., 1952; Oklahoma State University.

* COULTER, CHARLES A. (1961) .................................................. Music
B.S., Indiana State Teachers College, 1947; M.A., Columbia Teachers College, 1948; additional graduate study, Arizona State University, Tempe.
Experience: Music teacher, elementary, junior high, and high schools; faculty member, National Music Camp; first trombonist, Phoenix Symphony.

CRANE, FRANKLIN S. (1958) ......................................................... Mechanical Engineering
Petroleum Engineer, Colorado School of Mines, 1943; graduate study, Massachusetts Institute of Technology.
Experience: Division engineer, Oil Well Supply Company; chief engineer, Martin-Decker Corporation; secretary-treasurer and director, Decker Engineering Corporation; officer, U.S. Navy; registered petroleum engineer, California.

CRUIKSHANKS, ANDREW N. (1947) ................................................. Social Sciences
A.B., University of California, 1931; M.A., Stanford University, 1933; Ed.D., 1957.
Experience: Instructor, social studies and speech, Sacramento High School; educational supervisor, U.S. Department of Interior, CCC; instructor, social studies and speech Fort Bragg High School; director of adult education and community forums, Fort Bragg; tour director, Europe and Middle East; professional lecturer.

CULBERTSON, JAMES T. (1953) ....................................................... Mathematics
A.B., Yale University, 1934; Ph.D., 1940; other graduate study, University of Pennsylvania.
Experience: Research fellow, Yale University; professor, mathematics and physics, Cumberland University; head of mathematics department, Southwestern University; research associate mathematical biology, University of Chicago; assistant professor of philosophy, University of Southern California; research associate Rand Corporation.

* CULP, ROBERT L. (1963) .......................................................... Mechanical Engineering
B.S., Ohio State University, 1949; M.Ed., 1953; additional graduate study, Los Angeles State College and Long Beach State College.
Experience: Teacher, high schools, Wapakoneta, Ohio; San Marino and Monrovia, California.

CUMMINS, CARL C. (1958) ......................................................... Dean, Applied Arts Division
A.B., University of California, Santa Barbara, 1948; M.S., University of Southern California, 1952; Ed.D., University of California, 1957.

CURTIS, WILLIAM D. (1961) ......................................................... Education and Psychology
B.A., University of Redlands, 1948; M.A., University of California, Los Angeles, 1951; Ph.D., University of Denver, 1960.
Experience: Probation officer, Riverside County, California; school psychometrist, San Bernardino City Schools; teacher, San Bernardino High School; instructor, San Bernardino Valley College; part-time instructor, University of Redlands, University of Denver, International Business Machines Corporation.

* Kellogg-Voorhis staff.
DAUGHERTY, RAYMOND C. (1960)  
Physical Education  
B.S., State University of New York, 1951; M.S., 1956; additional graduate study at Springfield School of Physical Education, University of Buffalo, Los Angeles State College, Cortland State Teachers' College.  
Experience: Physical Education director, coach, Azusa High School; teacher, recreation director, coach, Alexander and Lowville, New York; instructor, Citrus College; chairman, Red Cross Water Safety Program, Pomona.

DAVIDSON, HAROLD P. (1936)  
Chairman, Music Department  
B.A., Pomona College, 1929; M.A., Claremont College, 1932; additional graduate study at University of Southern California.  
Experience: Head of Music Department, Emerson Junior High School, Pomona; master training teacher, Claremont College.

Military Science  
B.S., University of Pittsburgh, 1939; Command and General Staff College, 1960.  
Experience: Assistant professor of military science, Valley Forge Military Academy, 1955-57; training officer 1st Guided Missile Group, Fort Bliss; executive officer and battalion commander, Fifth Howitzer Battalion, Korea.

DAVIS, CHARLES P. (1958)  
Head, Aeronautical Engineering Department  
B.S., Rensselaer Polytechnic Institute, 1948.  
Experience: Instructor and assistant professor, Rensselaer Polytechnic Institute; development engineering and product engineer leader, General Electric Company.

DEAN, ARNOLD M. (1949)  
Soil Science  
B.S., University of Alberta, Canada, 1943; M.S., 1946; Ph.D., University of Wisconsin, 1949.  
Experience: Laboratory assistant, Dominion Department of Agriculture, Edmonton, Alberta; teaching assistant, University of Wisconsin; industrial fellowship, University of Wisconsin.

DE FEE, DAVID LEE (1963)  
Psychometrist  
B.A., University of Texas, 1963.  
Experience: Self employed, advertising, direct sales.

DEGEN, JAMES L. (1959)  
Ornamental Horticulture  
B.S., California State Polytechnic College, 1954.  
Experience: Nursery, landscape contracting business, Costa Mesa, California; U.S. Army.

DENDURENT, MYRON S. (1957)  
Physical Sciences  
B.S., Kansas State College, 1939; M.S., 1939.  

DE VOROS, EVELYN K. (1955)  
English and Speech  
B.A., University of Texas, 1936; M.A., University of Michigan, 1941; Ph.D., University of Michigan, 1945.  
Experience: Instructor in Texas Public Schools; instructor, Louisiana Polytechnic Institute; assistant professor, Bowling Green State University, Ohio, University of California, Santa Barbara College.

DICKEY, RICHARD K. (1956)  
Electrical Engineering  
B.S., University of California, 1948; M.S., 1956.  
Experience: Project engineer, Berkeley Scientific Co.; design engineer, Remler Co., Ltd.; engineer, Alameda Naval Air Station.
DICKSON, BRUCE A. (1952)  
Soil Science  
B.S.A., University of British Columbia, Canada, 1940; M.S.A., 1942; Ph.D., University of California, Berkeley, 1952.  
Experience: Teaching assistant, University of British Columbia; teaching assistant, University of California at Berkeley; assistant in plant nutrition, Dominion Experimental Station, Saanichton, B.C.; soil specialist, Dominion Experimental Farm, Agassiz, B.C.

DIETTERLE, RUTH (1962)  
Activities Adviser  
B.A., University of California, Berkeley, 1953; graduate study, University of California, San Francisco State Teachers College.

DILLION, JERRY L. (1954)  
Electronic Engineering  
B.S., California State Polytechnic College, 1954.  

DILLS, CHARLES E. (1963)  
Physical Sciences  
B.S., North Dakota State University, 1949; M.S., George Washington University, 1951; Ph.D., Harvard University, 1956; additional graduate study, Columbia University.  
Experience: Professor, Deep Springs College; assistant editor, American Chemical Society; chemist, National Research Corporation; assistant professor, Northwest Missouri State College.

DILTS, RALPH W. (1944)  
Social Sciences  
A.B., Montana State University, 1936; M.A., 1938; additional graduate study, University of California, 1940-41.  
Experience: Stevensville High School, Stevensville, Montana; graduate assistant, Montana State University; graduate assistant, University of California; U.S. Bureau of Reclamation.

* DIMITMAN, JEROME E. (1949)  
Head, Biological Sciences Department  
B.S., University of California at Berkeley, 1943; M.S., University of California, Citrus Experiment Station, Riverside, 1949; Ph.D., University of California, 1958.  
Experience: Citrus production, University of California at Los Angeles; assistant plant pathologist, California State Department of Agriculture; officer, U.S. Navy.

* DIVELBESS, DIANE (1963)  
Art  
B.A., Scripps College, 1957; M.F.A., Claremont Graduate School, 1959; additional graduate study, Claremont Graduate School, Fresno State College, Los Angeles State College.  
Experience: Teacher, Chaffey Union High School District, Riverside Art Center, Children’s Creative Workshops; professional painter.

* DONNELLY, CLAIRE KATHERINE (1961)  
Registered Nurse  
R.N., St. John’s Hospital School of Nursing, St. Louis, Mo., 1946.  
Experience: Inter-Community Hospital, Covina; Marr-Jacobs Medical Group, Pomona.

DUNIGAN, LOWELL H. (1961)  
Director of Institutional Studies  
B.S., Iowa State University, 1947; M.S., 1948; additional graduate study, University of Southern California.  
Experience: Officer, U.S. Navy; instructor in sociology, Iowa State University; claims adjuster, Employers Mutuals Insurance Company; research technician, California Highway Planning Survey; research technician, California State Department of Education, Division of State Colleges and Teacher Education.

DUNN, JOHN E. (1961)  
Agricultural Engineering  
B.S., Oregon State College, 1943; graduate study, Oregon State College, California State Polytechnic College, USNRAMS Columbia University, Naval Diesel School, Cornell University.  
Experience: Engineering officer, USNR; wholesale farm machinery 10 years, retail farm machinery 4 years; instructor, California State Polytechnic College 1948-1952

* Keilburg-Voorhis staff.
Dunn, Norman K. (1960) Animal Science
B.S., Colorado State University, 1951; M.S., Kansas State University, 1960.
Experience: County agricultural agent, Gunnison, Colorado; herdsman, Painter
Hereford Company, Denver, Colorado; graduate research assistant Kansas State
University.

Dunn, Wesley T. (1959) Printing Engineering and Management
Experience: Instructor, Compton High School; rotary press operator, Moore
Business Forms; 11 years experience as composition-press operator for various printing
firms.

B.S., Arizona State University, 1958; M.S., 1959; additional graduate study, University
of Southern California.
Experience: Lecturer, University of Southern California; instructor, Arizona
State University; research interviewer, SBA Motel Study, University of Arizona;
collateral-discount teller, Midland National Bank, Minneapolis; salesman, Dale’s
Department Store, Phoenix, Arizona; assistant to president, Holmberg Organ

Dutra, Ramiro C. (1959) Physical Sciences
B.S., University of California, 1954; M.S., 1956; Ph.D., 1958.
Experience: Teaching assistant and research assistant, University of California;
junior specialist to assistant specialist, Department of Food Science and Technology,
California Agricultural Experiment Station; lecturer in dairy chemistry, University
of California.

Ebersole, Walter (1958) Mechanical Engineering
B.A., Santa Barbara State College, 1941; graduate study, University of Southern
California, Los Angeles.
Experience: Project engineer, Shaffer Oil Tool Works, Brea; designer, University
of Southern California Engineering Center; process engineer, B. H. Hadley
Company, Pomona; instructor, engineering, drafting, etc., Mount San Antonio
College.

Elston, Charles A. (1947) Mathematics
A.B., Santa Barbara State College, 1932; M.S., University of Southern California,
1940; additional graduate study, University of Southern California, 1949.
Experience: Teacher, Santa Barbara County Schools; instructor, head, Mathematics
Department, Junior High School, and instructor, Adult Evening School, San
Luis Obispo; surveyor, U.S.E.D. and Southern Pacific Railroad.

Englund, Carl R. (1948) Dean, Agriculture Division
B.S., University of California, Berkeley, 1939.
Experience: Director of vocational agriculture, Reedley Union High School and
Junior College, Reedley; head, crops department, California State Polytechnic
College, Voorhis Unit.

Epps, Max (1960) Mechanical Engineering
B.S., University of Southern California, 1934; M.S., 1935.
Experience: General Petroleum Corporation, Los Angeles; chief automotive
engineer, Socony Vacuum, Paulsboro, New Jersey; assistant supervisor of engine
laboratories, Fairchild Aircraft, Ranger Engine Division, Farmingdale, New York;
assistant to chief engineer. Registered professional chemical engineer, California.

* Kellogg-Voorhis staff.
ERICSON, CHRISTINE (1955). Library
Experience: Beloit, Wisconsin, Public Library; Whiting, Indiana, Public Library;
Post Library, Fort Riley, Kansas.

ERNATT, EDWARD J. (1958). Education
A.B., Wayne State University, 1946; M.Ed., 1950; Ed.D., University of Michigan, 1956.
Experience: Elementary schoolteacher, Taylor Center Schools, Inkster, Michigan;
district superintendent, Nankin-Dearborn Schools, Inkster, Michigan; elementary
schoolteacher, Santa Barbara, California; supervising teacher, University of Califor-
nia, Santa Barbara College; district superintendent, West Park School District,
Fresno, California.

ERSPAMER, JACK L. (1956). Biological Sciences
B.S., University of Washington, 1941; Ph.D., University of California, 1953.
Experience: Teaching assistant, University of Washington, University of Cali-
ifornia; research assistant, University of California, Citrus Experiment Station, Riverside.

FALKENSTERN, OSWALD J. (1953). Mathematics
B.S., Montana State College, 1939; M.S., San Jose State College, 1952; additional
graduate study, University of Colorado, Colorado A & M College.
Experience: High school teacher and coach, Baker and Opheim, Montana; air
navigation officer, U.S. Navy; mathematics instructor, Colorado A & M College;
instructor and chairman of junior high school mathematics, Salinas.

FAUSCH, HOMER D. (1956). Animal Science
B.S., University of Minnesota, 1947; M.S., 1950; Ph.D., 1953.
Experience: U.S. Air Force; associate professor and head, animal husbandry de-
partment, Northwest Experiment Station, University of Minnesota, Crookston,
Minnesota; secretary-treasurer, Red River Valley Aerial Sprayers, Inc., Crookston,
Minnesota.

FEDERER, M. DALE (1963). Education
Experience: Officer, U.S. Army; instructor, Saratoga School District, Wyoming;
assistant instructor, extension instructor and assistant professor, University of
Wyoming.

FELLOWS, ALBERT MELVIN (1946)
Head, Printing Engineering and Management Department
Experience: Special training courses in journalism, advertising, mechanical art
and print shop management; U.S. Army, World War I; journeyman printer and
supervisor of apprentice training programs; superintendent of printing plants in
Kansas City, Missouri, and Birmingham, Alabama.

FERRIS, HORACE GARFIELD (1958). Physical Sciences
B.A., Pomona College, 1936; M.A., University of California, Los Angeles, 1939;
Ph.D., 1949.
Experience: Physicist, U.S. Naval Ordnance Test Station, California Institute of
Technology. Scripps Institute of Oceanography. Robert Shaw-Fulton Company,
Anaheim; Hughes Aircraft Company, Fullerton; lecturer, Pomona College, Univer-
sity of Southern California; instructor, San Diego State College; associate professor,
Chapman College.

FILLHART, DANIEL (1961). Metal Processes
Pasadena City College.
Experience: Tool and die man, James Jones Company, El Monte; experimental
machinist, Meister Engineering Co., Pasadena; tool and die maker, Winslow
den Products Corp., Glendale; instrument machinist, Giannini Controls, Corp.,
Pasadena.

* Kellogg-Voorhis staff.
FINK, HARRY C. (1962) Biological Sciences
B.S., Iowa State University, 1946; M.S., 1947; Ph.D., 1950.
Experience: Instructor, Iowa State University; research associate, Iowa State University; assistant professor, North Carolina State College, Agricultural Experiment Station; associate professor, Pennsylvania State University; project leader, fungicide; and nematocide research, Monsanto Chemical Company, St. Louis, Missouri.

FIRSTMAN, BRUCE L. (1962) Biological Sciences
Experience: Graduate laboratory assistant, Stanford University; associate in biology, San Jose State College; teaching fellow, University of California, Santa Barbara College; instructor, City College of San Francisco.

FISHER, CLYDE P. (1947) Dean, Applied Sciences Division
A.B., University of Oklahoma, 1942; M.A., University of Southern California, 1947; Ph.D., 1955.
Experience: Teaching assistant in mathematics, lecturer in mathematics, University of Southern California; officer, U.S. Army; instructor, mathematics; assistant to the dean, Liberal Arts Division; assistant to the executive dean; building program co-ordinator, executive secretary to the President's Cabinet; supervisor of Special Studies Staff; Dean, Educational Services and Curriculum Development; Dean of the College, California State Polytechnic College.

FITZPATRICK, MICHAEL (1963) Physical Sciences
B.S., California State Polytechnic College.
Experience: Chemistry stockroom assistant, Phoenix College; technical assistant, substitute instructor, California State Polytechnic College.

FLANAGAN, JAMES ROBERT (1959) Animal Husbandry
B.S., California State Polytechnic College, 1959.
Experience: Rancher.

FLYNN, JOHN M. (1963) Business Administration
B.S., University of Oregon, 1948; M.B.A., University of Southern California, 1949; additional graduate study, University of Southern California.
Experience: Instructor and department head, Santa Barbara City Schools; owner and operator of John M. Flynn & Co., stock broker; regional supervisor of business education, State of California; instructor, Santa Monica Unified School District; teacher and advisor, National Technical School, Los Angeles.

*FLYNN, THOMAS J. (1959) Mathematics
B.S., United States Naval Academy, 1927; M.S., Purdue University, 1959; additional graduate study, United States Naval Postgraduate School, Ordnance Engineering; Advanced Management Program, Harvard Business School.

FOLSON, VOLMAR A. (1946) Curriculum Supervisor
B.S., Iowa State College, 1934; M.Ed., Colorado University, 1937; additional graduate study, Southern Methodist University.
Experience: High school and junior college teaching; officer, U.S. Navy; assistant professor, mathematics, Southern Methodist University; instructor, mathematics, California State Polytechnic College.

*FORREST, WILLIAM M. (1957) Building Program Coordinator
A.B., University of California, 1956; M.S.L.S., University of Southern California, 1957.

* Kellogg-Voorhis staff.
FOTTER, MILLARD J. (1954) Head, Industrial Engineering Department
B.S., Armour Institute of Technology, 1935; M.S., University of Southern California, 1956.

FOX, FRANK W. (1957) Animal Husbandry
B.S., California State Polytechnic College, 1951; M.A., 1957.
Experience: Director of vocational agriculture, Lassen Union High School, Susanville.

B.S., Ohio State University, 1951; M.B.A., University of Miami, 1959; additional graduate study, University of Southern California.
Experience: Instructor, Marketing Department, Arizona State University; research associate, Bureau of Business Services, Arizona State University; instructor, summer session, Arizona State College; agent, Prudential Insurance Company; instructor, Naval Electronics School, U.S. Navy.

FOXEN, MILDRED E. (1955) Supervising Nurse
R.N., Women's Christian Association, 1943.
Experience: Resident nurse, College of Wooster, Wooster, Ohio; Intercommunity Hospital and office nurse, Medical Center, Covina.

FRANCIS, JOHN W. (1960) Assistant Foundation Manager, Kellogg Campus
Experience: Teacher, Los Angeles City Schools; California bar, 1961.

FRANCK, MICHEL N. (1956) Social Sciences
B.S., City College, New York City, 1934; M.A., New York University, 1935; Ph.D., 1949.
Experience: Trade delegate; commercial attaché, Brussels, Belgium; associate professor, Pacific Lutheran College; administrative assistant, Olin-Mathieson Chemical Corp.

FRENCH, JERE STUART (1957) Landscape Architecture
A.B., Washington University, 1951; B.S., Michigan State University, 1956.
Experience: Paving construction, St. Louis, Missouri; landscape architect, National Park Service, San Francisco; landscape architect, F. B. Stressau, Miami, Florida; instructor, U.S. Navy.

FRENCH, MILTON L. (1961) Language Arts
B.S., New York University, 1932; M.A., Columbia University, 1936; Ph.D., New York University, 1938.
Experience: Instructor, Monmouth Junior College; director of beginning English, American College; assistant professor, Baylor University; director of publications, Northern State Teachers College, Minot State Teachers College; assistant field director, American Red Cross; display advertising salesman, Fresno Bee; instructor, Selma Union High School; product service engineer, American Radiator and Standard Sanitary Corporation; technical editor, Models of Industry.

FREY, WINTON H. (1963) Biological Sciences
B.S., California State Polytechnic College; graduate study, University of Washington.
Experience: U.S. Air Force; nurseryman, Pappas Bros. Nursery; teaching assistant, California State Polytechnic College; graduate teaching assistant, University of Washington; nurseryman, Floral Arts Nursery; agricultural inspector, San Luis Obispo County; instructor, San Luis Obispo City Adult School; consultant, Loomis & Sons Nursery.

* Kellogg-Voorhis staff.
FROST, ROBERT H. (1953) .......................................................... Physical Sciences
A.B., University of California, 1939; M.A., 1945; Ph.D., 1947.
Experience: Teaching assistant, University of California; assistant professor, University of Missouri.

FRYBERGER, E. L. (1957) ............................................................ Electrical Engineering
B.S., U. S. Naval Academy, 1923; M.S., Harvard University, 1930; additional graduate study, U. S. Naval Post Graduate School, George Washington University.
Experience: Officer, U. S. Navy (Retired); instructor, George Washington University; associate professor, Valparaiso University.

FULBECK, JOHN F. (1958) .......................................................... Language Arts
A.B., University of Southern California, 1951; Ph.D., 1960.
Experience: Scholastic Magazine, New Jersey state representative; advertising manager, Independent Press, Bloomfield, New Jersey; U. S. Navy; editor, Southwest News Press, The South End Bee, Los Angeles; instructor and lecturer, University of Southern California, Chouinard Art Institute, Los Angeles.

FULLER, KENNETH G. (1960) ...................................................... Mathematics
A.B., Indiana University, 1925; A.M., University of Nebraska, 1927; Ph.D., Columbia University, 1948.
Experience: Instructor of mathematics, Northwestern University, Brown University, Long Island University, The College of the City of New York; officer and instructor, U. S. Military Academy; professor and chairman, mathematics department, Central Connecticut State College.

FURMISKY, GEORGE S. (1955) ..................................................... Electrical Engineering
B.S., Bradley University, 1949; M.S., 1950.
Experience: Instructor, Peoria Manual Training High School; graduate assistant, Bradley University; superintendent, buildings and grounds, Blackburn College.

FURST, EMANUEL F. (1963) ....................................................... Electronic Engineering
Experience: Computer engineer, Brookhaven National Laboratory.

GAGITSKELL, JUNE (1962) .......................................................... Activities Adviser
B.A., Scripps College, 1940; M.A., Claremont University College, 1962.

GALBRAITH, EDWARD D. (1962) ............................................... Mechanical Engineering
Experience: Assistant professor, University of Toledo; engineer, Owens-Illinois Glass Company, Toledo Edison Company; officer, U. S. Army.

GALBREATH, GEORGE T. (1953) ................................................ Social Sciences
A.B., Stanford University, 1948; M.A., 1949; additional graduate study, University of California.
Experience: Instructor, California State Polytechnic College, San Luis Obispo Campus; assistant professor of economics, Armstrong College; manager, Galbreath Orchards.

GALLION, ARTHUR B. (1963) ................................................... Architectural Engineering
B.S., University of Illinois, 1924. FAIA.
Experience: Steedman fellow; Ecole Des Beaux Arts, Paris; regional and project planner, Housing Division, Public Works Administration, Washington, D.C.; director for development, Federal Public Housing Authority, San Francisco; dean, School of Architecture, University of Southern California; director of planning, Harland Bartholomew & Associates, Honolulu, Hawaii. Registered architect, California, Illinois and Hawaii.

* Kellogg-Voorhis staff.
GANTZ, BEN S. (1963) ............................................................. Social Sciences
B.A., University of Southern California, 1942; M.A., University of Chicago, 1956; additional graduate study, University of Puerto Rico, Loyola University of Chicago, Claremont Graduate School.
Experience: Officer, U.S. Navy; administrative staff, U.S. Naval Post Graduate School; instructor, University of Alaska; psychologist, Alaska Crippled Children's Treatment Center; Desert Area Counseling Service, China Lake; research psychologist, Naval, Ordnance Test Station; research assistant, Claremont Graduate School.

GARRITY, RODMAN F. (1962) ................................................ Social Sciences; Coordinator of Elementary Education
Experience: Teacher, principal and psychologist, Palmdale and Redondo Beach City Schools; junior college instructor, Los Angeles, Palo Verde, San Bernardino and Citrus Junior Colleges; consulting psychologist to Big Bear Lake and Palo Verde Unified Schools; assistant director of educational placement, assistant coordinator of Congolese program, lecturer in educational administration, University of Southern California; California certified psychologist.

GATES, DOROTHY L. (1961) ................................................ Library
B.A., University of California, 1927; Certificate of Librarianship, University of California Library School, 1928.
Experience: University of California Library; San Luis Obispo County Library; Atascadero State Hospital Library.

GATES, VINCENT J. (1958) ................................................ Technical Journalism
B.S., University of Oregon, 1939; graduate study, Sacramento State College.
Experience: Editorial positions on daily newspapers in San Francisco, San Jose, Santa Rosa, Salinas; industrial editorial positions, Henry J. Kaiser Industries; public relations and press positions, U.S. Navy, California State Employees Association, California State Polytechnic College.

GELLER, IRWIN (1962) ................................................ Physical Sciences
B.A., Emory and Henry College, 1943; M.S., University of Puget Sound, 1953; Ph.D., Pennsylvania State University, 1959.
Experience: Manager, Bulk Oil Storage Depot, Leyte, Philippine Islands; part-owner, automobile agency, Roslyn, New York; research assistant in fuel technology, Pennsylvania State University; research chemist, solid rocket fuels, Aerojet-General Corporation, Azusa; evening instructor, Citrus College.

GENTHNER, FREDERICK L. (1952) ...................................... Library
Experience: Periodicals librarian, Ball State Teachers College; officer, U.S. Army; assistant reference librarian, Ohio State University.

GERARD, E. DOUGLAS (1951) ......................................... Building Program Coordinator
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951.
Experience: Instructor, University of British Columbia; instructor, University of Saskatchewan; shop superintendent, British Columbia Forest Products, Pitt Lake, British Columbia; service manager, Tractor and Allied Equipment, Limited, Melfort, Saskatchewan.

GERBER, PHILIP L. (1962) ................................................. Head, English and Speech Department
B.A., University of Iowa, 1946; M.A., 1948; Ph.D., 1952; additional graduate study, University of Oregon.
Experience: Instructor, University of Iowa; professor of English, Pan American College; associate professor of English and director of freshman English, University of Utah.
GESLER, JACK T. (1957) Animal Science
B.S., California State Polytechnic College, 1952; M.S., Kansas State College, 1956; additional graduate study, State College of Washington.
Experience: Instructor in meats, State College of Washington; assistant meats instructor, Kansas State College.

GIBBONS, BILLIE D. (1963) Education
A.B., University of California, 1950; M.A., Long Beach State College, 1957; additional graduate study, University of Southern California.
Experience: Graduate manager, Long Beach State College; research engineer, North American Aviation; associate research scientist, American Institute for Research; human factors specialist, Nortronics Corp.; engineering psychologist, Aerojet-General Corporation.

B.S., California State Polytechnic College, 1962.
Experience: Livestock and Ranch work, Mackay, Idaho; Manager, Gibbs Drive-In Dairy, Twin Falls, Idaho; U.S. Air Force.

B.S., California State Polytechnic College, 1947.
Experience: Horse trainer, Ed Wright Stables and 1001 Ranch, Riverside; horse trainer and horseshoer, San Luis Obispo; employee, Humphrey Meat Packing Company, San Miguel; Pacific Valley Cattle Company, King City; U.S. Marine Corps.

GIBBON, J. CORDNER (1949) Assistant Dean of Agriculture
B.S., University of California, 1937; M.S., University of Southern California, 1955.
Experience: Director of vocational agriculture, Downey and Whittier Union High Schools; U.S. Army; regional supervisor, Bureau of Agricultural Education; Dean, Student Personnel and Business Management, Kellogg-Voorhis.

GILBERT, JOHN R. (1961) Mathematics
B.S., California State Polytechnic College, 1957; M.A., 1959; additional graduate study, Oklahoma State University.
Experience: U.S. Navy; mathematics instructor, California State Polytechnic College; research engineer, Lockheed Missile & Space Company, Vandenberg AFB; coordinator of special services, California State Polytechnic College.

GLASSER, WALTER W. (1960) Art
B.A., University of California at Los Angeles, 1953; M.F.A., Claremont Graduate School, 1959.
Experience: Staff artist, U.S. Navy; teacher, San Gabriel City Schools; freelance artist.

GLADDEN, WALLACE F. (1961) Veterinary Science
Experience: U.S. Army Veterinary Corps; poultry research, U.C.D.; large and small animal practice, southern California.

GOLD, MARCUS (1947) Audio-Visual Service Coordinator
B.A., University of California, 1942; B.L.S., 1947; additional graduate study, University of California.
Experience: U.S. Army; library, University of California; audio-visual librarian, California State Polytechnic College; research assistant, University of California.

GONAN, LILLIAN I. (1963) English and Speech
B.S., Danbury State Teachers College, 1950; M.A., University of California, 1958; additional graduate study, University of Southern California.
Experience: Junior high school teacher, Visalia and Hermosa Beach; teaching assistant, University of Southern California; teacher, Cambria School.

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GOODE, JESSE B. (1956) ------------------- -------------.. ---- - Mathematics
B.S., U.S. Naval Academy, 1919; M.S., Columbia University, 1926; U.S. Naval Academy Post Graduate School.
Experience: United States Navy; instructor, Clinch Valley College, University of Virginia.

GOODIN, JAMES D. (1962) ------------------- Mechanical Engineering
B.S.M.E., University of Southern California, 1957.
Experience: Production supervisor, Union Carbide Chemicals Co.; junior mechanical engineer, Southern California Edison Company.

GORMAN, LEO P. (1957) ------------------- Welding
Adult Teacher Certificate, University of California, Los Angeles, 1941.

GOULD, NORMAN S. (1950) ------------------- Education and Psychology
A.B., Pomona College, 1948; M.S., University of Southern California, 1949; Ph.D., Florida State University, 1961.
Experience: Instructor, Basic Medical Sciences, U.S. Army; Assistant to Dean of Students, University of Southern California; Lecturer, University of California Extension Division; Instructor, Florida State University.

GOW, IMOGENE V. (1947) ------------------- Supervising Nurse
R.N., Union Labor Hospital, Eureka, 1921.
Experience: In charge floor nurses, Union Labor Hospital; nurse, Stanford Lane, San Francisco; private duty, Eureka and Yreka.

GRAN, RUTH (1957) ------------------- Graduate Nurse
R.N., Mary’s Help Hospital, San Francisco, 1936.
Experience: San Mateo Clinic; Army Nurse Corps; San Luis Obispo General Hospital.

GRANT, DAVID M. (1950) ------------------- English and Speech
B.A., Iowa State Teachers College, 1935; M.A., University of Iowa, 1940; Ph.D., Stanford University, 1953.
Experience: Instructor in public schools in Iowa; chairman, Department of Speech, Hastings College. Hastings, Nebraska; officer, U.S. Navy; instructor, Stanford University.

GREAT, GEORGE (1958) ------------------- Aerospace Engineering
B.S., Marquette University, 1955.

GRAVES, R. L., JR. (1951) (1957) ------------------- Architectural Engineering
B.S., University of Kansas, 1948; M. Arch. and Urban Design, Cranbrook Academy of Art, 1950.
Experience: Instructor, University of Florida; University of Alabama; State College of Washington; University of Kansas; architect, private practice; designer, L. N. Boney, Architect; draftsman, R. R. Calder, Architect; U. S. War Department; U. S. Navy.

GRAVES, THEODORID G. (1947) ------------------- Air Conditioning and Refrigeration Engineering
B.A., Humboldt State College, 1940; M.S., Oregon State College, 1957.
Experience: Instructor, Paia School, Paia, Maui, Hawaii; instructor, Maui High School, Maui, Hawaii; teacher, San Francisco, California; lecturer, University of California, Santa Barbara College.

Kellogg: Voorhis staff.
GREGORY, C. HEROLD (1950) ............................ Printing Engineering and Management
B.S., California State Polytechnic College, 1952.

* GREGORY, VERNON L. (1953) ................................ Biological Sciences
B.S., University of Miami, 1941; M.A., DePauw University, 1947; additional graduate study, University of Southern California, 1949-1953.
Experience: Undergraduate assistant in zoology, University of Miami; graduate assistant, DePauw University; naval aviator, United States Navy; flight instructor, United States Navy; instructor in zoology, University of Miami; graduate associate, University of Southern California; curriculum specialist, California State Polytechnic College.

* GRIFFIN, JAMES M. (1949) ................................ Ornamental Horticulture
B.S., California State Polytechnic College, 1949; M.A., 1952.

GUSTAFSON, LESTER W. (1947) .............................. Aeronautical Engineering
B.S., University of Minnesota, 1932; graduate study, University of Minnesota.
Experience: Assistant in experimental engineering, University of Minnesota; experimental engineer, Minneapolis Moline Power Implement Company, Minneapolis; Tropic Air Corporation, Chicago; aerodynamics engineer, Lockheed Aircraft Corporation; Hughes Aircraft Company.

* HALDERMAN, DONALD L. (1959) ......................... Physical Education
B.S., University of Southern California, 1951; M.S., 1959.
Experience: Teacher-coach, Whittier High School and California High School, Whittier; naval aviator, United States Naval Reserve.

HALL, RICHARD E. (1947) .................................. Machine Shop
B.S., California State Polytechnic College, 1952; training on Packard aircraft engines, 1942; Allison aircraft engines, 1944; Pratt and Whitney aircraft engines, 1948.
Experience: Aircraft mechanic, Lockheed Aircraft, and Hancock Field, Santa Maria; mechanic, Sacramento Air Depot.

HAMLIN, LINDA H. (1963) .................................. Activities Adviser
B.A., Syracuse University, 1962.
Experience: American Field Service international scholarships.

HAMMITT, LEWIS E. (1946) ................................ Physical Sciences
B.S., Whitman College, 1926; M.A., University of Washington, 1940; additional graduate study, University of Washington, U.S. Navy Air Navigation School, 1943.

HANKS, CHARLES J. (1954) ................................ Mathematics
Experience: Assistant professor, Drexel Institute of Technology; line coach and graduate assistant, University of Arkansas; officer, U.S. Coast Guard.

HANSEN, PHYLLIS JEAN (1963) ............................ Library
Experience: Student assistant, University of Illinois Library; librarian, Queens Borough Public Library; reference librarian, Community Library, San Leandro, California.

* Kellogg-Voorhis staff
* HANSON, CHARLES L. (1961)  Graduate Manager
B.A., University of Redlands, 1957; graduate study at San Diego State College and California Western University.
Experience: YMCA Boys' Secretary; U.S. Army—Personnel Department and Finance Department; Crown Enterprises, Comptroller and General Manager.

HARBERT, MARY E. (1963)  Social Sciences
B.S., University of Oregon, 1948; M.A., 1950; additional graduate study, University of Oregon.
Experience: Public relations, Philippine Air Lines; executive secretary, The Sacramento Bee; teaching fellow, University of Oregon.

HARDEMAN, SARAH A. (1960)  Home Economics
B.S., Tennessee College, 1930; M.S., Iowa State University, 1946; additional graduate study at University of Tennessee (Martin Branch), Iowa State University.
Experience: Vocational Home Economics teacher, high schools in Tennessee.

HARDEN, F. SHELDON (1948)  Physical Education and Athletics
Experience: Player-coach, Sacramento Nuggets professional football team; playground supervisor, City of Sacramento; Red Cross swimming instructor, San Luis Obispo High School; officer, U.S. Army.

* HARDY, JOHN F. (1962)  Accountancy
B.S., George Pepperdine College, 1958.
Experience: Staff accountant, Darling, Wold and Agee, Certified Public Accountants; certified public accountant.

* HARMER, RUTH M. (1960)  English
B.A., Barnard College, 1941; M.A., Columbia University, 1942; additional graduate study, University of Southern California.
Experience: Instructor, University of Southern California and Mexico City College; lecturer, University of Hartford Courant, Washington Times-Herald; editorial assistant, American Speech; writer, Mutual Broadcasting Company.

HARRIS, ROY M. (1954)  Animal Husbandry
B.S., Utah State Agricultural College, 1952; M.S., 1954.

* HARRIS, WILLIAM M. (1960)  Chairman, Welding Department
B.S., 1950; B.S.M.E., 1952, Missouri School of Mines and Metallurgy; graduate study, Washington University, St. Louis, Missouri.

HASKELL, CHARLES THOMAS (1963)  Mathematics
B.A., University of Washington, 1946; M.S., University of Arizona, 1961; additional graduate study, University of Arizona.
Experience: Teacher, Fallon, Nevada, High School; trust clerk, Peoples National Bank of Washington; trust clerk, assistant trust officer, First National Bank of Nevada; graduate assistant, University of Arizona.

* Kellogg-Voorhis staff.
HASSLEIN, GEO. JOHANN (1949) Head, Architecture and Architectural Engineering Department

B. of Arch., University of Southern California, 1945; A.I.A.
Experience: Road and bridge design in Mexico and Central America for Pan-American Highway; airport design for Army Engineers; development work at M.I.T. for Gilfillan Bros.; with architects and practice in Los Angeles area; designer for Summer Spaulding and Wurdemann and Becket; chief designer, Kistner, Curtis and Wright. Registered architect, California.

HATFIELD, R. C. (1949) Biological Sciences
B.Sc., University of Dayton, 1941; M.A., University of California at Los Angeles, 1947; Ph.D., 1950.
Experience: Chemist, Research Division, National Cash Register Co.; U.S. Navy; assistant in bacteriology, University of California at Los Angeles; chief of laboratories, F.O.D. Assessment Branch, U.S. Army Biological Warfare Laboratories, Fort Detrick, Maryland.

HAUGH, CHARLES R. (1961) Landscape Architecture

HAYES, HAROLD P. (1952) Dean, Engineering Division
B.M.E., University of Santa Clara, 1941; graduate study, Stanford University.
Experience: Test and commercial engineer, General Electric Company; officer, U.S. Navy; head of Mechanical Engineering Department, University of Santa Clara, 1946-1951; sales engineer, Dudley Machinery Corporation. Registered professional engineer, California.

HEALEY, JOHN R. (1947) Journalism and Publications
B.A., San Jose State College, 1941; graduate study, U.C.L.A.
Experience: Reporter, San Jose News; public relations, McClellan Field, Sacramento; reporter, Sacramento Union; Valley editor, Modesto Bee.

HEALEY, ROBERT JOSEPH (1958) Coordinator of Athletics
B.S., State Teachers' College, Salem, Massachusetts, 1950; M.S., Oklahoma State University, 1952; additional graduate study, San Francisco State College.
Experience: U.S. Navy; teaching fellow and instructor, Oklahoma State University; office manager, Groendyke Transportation, Inc., Wichita, Kansas; instructor, Modesto High School, Modesto.

HEATH, FREDERICK B. (1962) Social Sciences
A.B., Syracuse University, 1949; M.A., 1950; Ph.D., University of Southern California, 1958.
Experience: United States Army; graduate fellow, lecturer, University of Southern California; instructor, Chouinard Art Institute; lecturer, Long Beach State College, Los Angeles State College.

HEIFETZ, EMANUEL R. (1962) Music
B.A., University of Redlands, 1950; M.M., 1958; additional graduate study, Claremont Graduate School. Extensive private music study with Luboviski, Pollak, Zaslansky, and Meremblum.
Experience: Instrumental music instructor, San Bernardino Valley College; string and orchestra director, Summer Music Workshops; instructor-director, Community Orchestra, San Bernardino Adult Education; master teacher, University of Redlands; instrumental music teacher, Redlands City Schools and Inglewood Unified School District; composer of published violin method and other works.

* Kellogg-Voorhis staff.
HEINZ, JOHN A. (1953) Acting Chairman, Audio Visual Department
B.A., University of Washington, 1950; graduate study, San Francisco State College, Ohio State University.
Experience: Technical and research assistant, University of Washington; production assistant, Korry Film Productions; free lance photographer, Seattle; production co-ordinator, Criterion Films, Inc., Seattle; film editor, KRON-TV, San Francisco.

HELMAN, ANATOL (1957) Architectural Engineering
B.S., Warsaw Polytechnic Institute, 1934.
Experience: Designer, Associated Architects and Planners, Dallas, Tex.; The Anglo-Iranian Oil Co., Abadan, Iran; master-planner, International Technical Associates (ITA); Architects-Planners, Milan, Italy; architect, T. B. Bourne Associates, Washington, D.C. and Tokyo, Japan; Tecnicos Expanoles Asociados, Madrid, Spain; Warsaw Municipality; instructor, University of Nebraska; University of Oklahoma; Navy Orientation School.

HENNING, LLOYD R. (1963) Medical Officer
B.S., University of California, 1927; M.D., 1932.
Experience: Internship, San Francisco General Hospital; residency, Franklin Hospital, San Francisco; U.S. Army; private practice, Willows.

HENRICKSON, JOHN R. (1961) English
Experience: Teaching assistant, Florida State University; instructor, Middle Tennessee State College.

HENDRICKS, HAROLD J. (1952) Electronic Engineering
B.S., Iowa State University, 1940; M.S., 1941; additional graduate study, University of Colorado, 1949.

HERALD, CHARLES A. (1958) Electronic Engineering
B.Sc., M.Sc., Dalhousie University, Halifax, Nova Scotia, 1935.
Experience: Assistant professor, University of Massachusetts; instructor, Pennsylvania State University; instructor, Communication School, Canadian Department of National Defense; lecturer, McGill University; lecturer, University of British Columbia; special gauge examiner, assistant and junior physicist, National Research Council, Ottawa.

HESCH, EARL R. (1956) Mechanical Engineering
B.S., University of New Mexico, 1955; M.S., Oklahoma A. & M. College, 1956.

* Kellogg-Voorhis staff.
HESSE, WALTER H. (1956) ........................................ Physical Sciences
B.S., California State Polytechnic College, 1952; M.S., Cornell University, 1953; Ph.D., 1955.
Experience: Research assistant, Cornell University; teaching and research, University of Nevada; research, California Institute of Technology; engineering officer USNR and Merchant Marine.

HICKEY, WILLIAM A. (1963) ........................................ Physical Sciences
B.S., U.S. Naval Academy, 1924; M.S., University of California, 1932.
Experience: Statistician, State of Michigan; dean of engineering, Detroit College of Applied Science; staff engineer, Chrysler Corporation Missile Division; dean of college of engineering, Detroit Institute of Technology; captain, U.S. Navy.

HICKS, WILLIAM R. (1957) ........................................ Physical Education
B.S., University of California, Los Angeles, 1950; M.A., Long Beach State College, 1959.
Experience: United States Army; teacher, Long Beach City Schools.

HIGMAN, LOIS (1963) ................................................ Library
A.B., Pomona College, 1948; B.L.S., University of California, 1954.
Experience: Reference assistant, Stockton Public Library; head of reference department, Stockton College Library; head reference librarian, Palo Alto Public Library.

HITCHCOCK, VAUGHAN D. (1962) ........................................ Physical Education
B.S., Washington State University, 1956; graduate study, San Francisco State College, San Jose State College, Alameda State College, University of California.
Experience: Physical education instructor, football and wrestling coach, Castro Valley High School; physical education instructor, football and wrestling coach, Hayward High School; teacher, Juvenile Hall, Alameda County Special Schools; playground, swimming and recreation director, Hayward Area Recreation Department, Hayward.

HO, FRANKLIN Y. H. (1961) ........................................ Social Sciences
B.A., National Southwestern Associated University, 1942; M.A., University of Southern California, 1951; Ph.D., 1957; post-doctoral study at University of Washington and University of California.
Experience: Editor, National Construct; industrial engineer, Utility Appliance Corp.; U.S. Government service; instructor, National Sun Yat-sen University; instructor, Santa Rosa Junior College; associate professor of business administration and research project director, University of Portland.

HOBBS, KENNETH R. (1950) ........................................ Agricultural Services and Inspection
Experience: Technician and curator, Department of Entomology, Oregon State College; agricultural inspector, Los Angeles County Department of Agriculture; inspector, Bureau of Nursery Service, State Department of Agriculture; field representative, structural pest control.

HOFFMAN, GEORGE E. (1956) ........................................ Industrial Engineering
B.S., Carnegie Institute of Technology, 1951; M.B.A., University of Southern California, 1959; M.S., Stanford University, 1960.

HOGAN, WILBUR C. (1959) ........................................ Mathematics
B.S., United States Coast Guard Academy, 1928; M.S., Purdue University, 1959.
Experience: Officer, U.S. Coast Guard; commanding officer, Port Townsend Training Station; director, U.S. Coast Guard Institute.

HOLLEY, F. JERALD (1961) ........................................ Registrar
B.S., Utah State University, 1961.
HOLLINGSWORTH, CAROL L. (1959) Placement Supervisor
B.A., Whittier College, 1956; graduate study, Long Beach State College.
Experience: Summer camp counselor, Long Beach Public Schools; teacher, Owens Valley Unified School District, Independence; employment security officer, Department of Employment, State of California, Sacramento.

HOLMQVIST, ROBERT E. (1946) Physical Sciences
B.A., University of Oregon, 1932; M.A., Oregon State College, 1936; additional graduate study, Purdue University and University of Washington.
Experience: Teaching assistant, University of Oregon and Oregon State College; instructor, University of Oregon; teaching fellow, Purdue University and University of Washington; inspection supervisor, Boeing Aircraft Company.

HOLT, RAY J. (1955) Physical Sciences
A.B., University of California, 1939; M.A., 1949.
Experience: Physicist, University of California Radiation Laboratory; aircraft inspector, Consolidated Vultee Aircraft Corporation; high school and junior college teacher.

HOLTZ, WALTER E. (1954) Head, Mechanical Engineering Department
B.S., Illinois Institute of Technology, 1949; M.S.M.E., California Institute of Technology, 1951.
Experience: Project engineer, Aerojet Corporation, Azusa; project engineer, Baker Engineering Corporation, Los Angeles; engineer, Carrier Corporation, Chicago; U.S. Naval Air Missile Test Center, Point Mugu; instructor, mechanical engineering, California State Polytechnic College, San Luis Obispo; officer, U.S. Air Force; registered professional engineer, California.

HOMFELD, GILBERT L. (1960) Mathematics
Experience: Tulare County Schools Office, teaching; school building draftsman and inspector; engineering draftsman, Southern California Gas Company, Visalia; ranching in Visalia; teaching, Selma Junior High School, Fresno County.

HONEYGGER, HARRY H. (1961) Metallurgical Engineering
Experience: Welder, Oregon Shipyards; U.S. Army; laboratory supervisor, Metallurgical Engineers, Inc.; registered professional engineer, Oregon.

Experience: Instructor in horseshoeing and blacksmithing, U.S. Army; horseshoer, Porterville.

HOOVER, ROBERT F. (1946) Biological Sciences
B.A., Stanford University, 1934; M.A., University of California, 1935; Ph.D., 1937.
Experience: Teaching assistant and research assistant, University of California; instructor, Yakima Valley Junior College; U.S. Army.

HOSTETTER, H. CLYDE (1958) Technical Journalism
B.J., University of Missouri, 1949; graduate study, University of Kansas, University of Southern California, American University.
Experience: Officer, U.S. Navy; feature writer and chief photographer, Topeka (Kansas) Daily Capital; public relations director, United States Junior Chamber of Commerce; public relations consultant, Hughes Aircraft Company; editor official Kansas magazine, To the Stars; editor official Junior Chamber magazine, Future; associate editor, Pathfinder and Town Journal; free-lance writer and photographer.

* Kellogg-Voorhis staff.
HOUK, A. L. (1946) ........................................ Physical Sciences
B.S., Michigan State College, 1926; M.S., 1928; Ph.D., Pennsylvania State College, 1933.
Experience: Graduate assistant in chemistry, Michigan State College and Pennsylvania State College; analyst, Michigan Agricultural Experiment Station; instructor in chemistry, Michigan State College; research chemist and group leader, Rohm and Haas Company, Philadelphia, Pennsylvania.

HOULIS, JEROME F. (1959) .................................................. Physical Sciences
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College.

HOUSE, HENRY (1947) .................................................. Associate Dean (Activities)
B.S., California State Polytechnic College, 1943; graduate study, University of California, California State Polytechnic College.
Experience: Director of vocational agriculture, Brawley Union High School; officer, U.S. Marine Corps.

HOUSTON, ERNEST R. (1957) ............................................... Ornamental Horticulture
B.S., Oklahoma State University, 1943; M.S., Ohio State University, 1947; additional graduate study, Oklahoma State University.
Experience: Assistant professor, Oklahoma State University; manager of plant shipments, Furrow and Co., Guthrie, Oklahoma; grower and consultant, Higdon Flower Shop and Nursery, Oklahoma City, Oklahoma; U.S. Army.

HOWE, HENRY E. (1956) .................................................. Printing Engineering and Management
B.A., University of Wisconsin, 1930; B.S., Stout Institute, 1942; graduate study, University of Wisconsin, Stout Institute.
Experience: Assistant, newspaper plant; instructor-coordinator, Stout Institute, Racine Vocational School, U.S. Air Corps; editor and publisher, The Dial, Wisconsin.

HUDIBURG, GRACE J. (1962) ............................................. Home Economics
B.S., University of Texas, 1946; M.A., Texas Women's University, 1953.
Experience: Home service director, Houston Natural Gas, Houston, Texas; vocational homemaking teacher in junior and high schools, Texas; textile research, Denton, Texas; assistant buyer, Foley's Department Store, Houston, Texas; dietitian, Bridgeport and Austin, Texas; kindergarten teacher, Houston, Texas.

HUEMER, DAVID A. (1962) ................................................. Mathematics
B.A., Pomona College, 1959; M.A., Claremont Graduate School, 1962; additional graduate study, University of Oregon.
Experience: Computing analyst, Douglas Aircraft; teaching fellow, University of Oregon.

HUGHES, LEROY BARRY (1950) .......................................... Physical Education and Athletics
B.S., University of Oregon, 1931; M.A., Stanford University, 1950.

HUOT, ROBERT J. (1963) .................................................. English and Speech
B.A., University of Washington, 1946; M.A., 1951; additional graduate study, University of Utah.
Experience: Teaching fellow, University of Washington; instructor, Tulane University; associate, University of Washington; instructor, Montana State College; graduate assistant, University of Utah.

HUTCHINSON, RALPH B. (1960) ......................................... Social Sciences
A.B., University of California, 1953; M.A., 1960; additional graduate study, University of California at Los Angeles.
Experience: Instructor, Long Beach State College; officer, U.S. Army.

* Kellogg-Voorhis staff.
HYER, EDGAR A. (1951)  Head, Farm Management Department
B.S., Utah State College, 1939; M.S., 1942; Ph.D., Cornell University, 1948.
Experience: Land use economist, Utah; field supervisor of A.A.A., Utah; U.S.
Army; graduate assistant, Cornell University; assistant professor of agricultural
economics, Oregon State College.

HYNES, C. DENNIS (1957)  Biological Sciences
B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., Uni-
Experience: Museum assistant, University of Michigan; teaching assistant and
research assistant, University of Florida.

IRVINE, ROBERT G. (1959)  Electronic Engineering
B.S.E.E., Utah State University, 1956.
Experience: Electronic engineer, Convair, Pomona.

IVES, QUAY D. (1960)  Metal Processes
B.S., M.S., Texas College, 1951; additional graduate study, University of Cali-
fornia at Los Angeles.
Experience: Instructor, Claremont Unified Schools, Claremont; Starr Common-
wealth School, Albion, Michigan; factory superintendent and assistant engineer,
Dico Corporation, Des Moines, Iowa; instructor, Del Mar College, Corpus Christi,
Texas; tool and die maker, Ryan Aircraft, San Diego.

JACKMAN, CLARENCE H. (1960)  Business Management, Coordinator of
Business Internships
B.S., Northwestern University, 1935; M.A., 1939; M.B.A., Bradley University
1956.
Experience: Instructor, Spencerian College, Monmouth (Illinois) High School,
University of Illinois; associate professor and assistant director of Evening Division,
Bradley University; general manager, Schaefer Feed and Grain Company; auditor,
Arthur Young & Company; officer, U. S. Air Force Auditor General; auditor, Bowman
Bros. Shoe stores; certified public accountant.

JACKSON, LEON S. (1961)  Physical Education
B.S., California State Polytechnic College, 1960.
Experience: U. S. Army Special Services; part-time baseball coach, Imperial Val-
ley High School; part-time coach, Cal Poly; recreation adviser, Boys Republic;
part-time physical education instructor, Bonita Union High School.

JAMES, ARTHUR F. (1956)  Medical Officer
M.D., University of Chicago, 1953; B.A., University of California at Los Angeles.
Experience: Internship, U.S.P.H.S. Hospital, Staten Island, New York; U.S.
Public Health Service, San Pedro; private practice, Wilmington.

JENKINS, JOHN L. (1956)  Home Economics
University of Wisconsin, 1923; University of California, 1956.
Experience: Own decorating business; instructor, adult education, various Cali-
fornia schools.

JENKINS, STARR (1961)  English
B.A., University of New Mexico, 1948; M.A., Stanford University, 1959.
Experience: Navy and Army; instructor, Albuquerque Public High Schools;
laborer, firefighter, smokejumper and aerial observer with U. S. Forest Service,
California, Oregon, Montana, and Idaho; national park ranger, Yosemite; informa-
tion specialist (writer-photographer), U. S. Forest Service, Southwestern Regional
Office, Albuquerque, New Mexico; free-lance writer-photographer.

JENSEN, JAMES J. (1948)  Physical Education and Athletics
A.B., Washington State College, 1935; M.S., Stanford University, 1940.
Experience: Football and track coach, Shelton High School, Washington; history
teacher and football and track coach, Santa Rosa High School, Santa Rosa; track
coach and guidance assistant, Menlo Junior College, Menlo Park; U. S. Navy; track
coach and instructor in health and physical education, San Francisco Junior College.

Kellogg-Voorhis staff.
JENSEN, JoANN S. (1963) Biological Sciences
B.A., Pacific Lutheran University, 1954; M.A., University of Southern California, 1957; Ph.D., Iowa State University, 1961.
Experience: Graduate teaching assistant, University of Southern California and Iowa State University; graduate research assistant on Public Health Service Grant, Iowa State University; instructor, Iowa State University; assistant professor, California Lutheran College.

JENSEN, ROBERT P. (1954) Mechanical Engineering
B.S., The Stout Institute, 1932; M.S., 1938.
Experience: Instructor, Orange Coast College, College of the Sequoias; assistant professor, Kansas State Teachers College; instructor, Maryland high schools; operation sheet writer in production engineering, Pratt Whitney Corporation, Kansas City, Missouri.

JOHNSON, CORWIN M. Head, Crops Department
B.S., State College of Washington, 1950; M.S., 1951; Ph.D., Cornell University, 1953.
Experience: Field and laboratory technician, research assistant, Department of Agronomy, State College of Washington; research assistant, Department of Agronomy, Cornell University; research agronomist, Northwestern Washington Experiment Station; assistant professor and agronomist, Mississippi State University.

JOHNSON, MEAD R. (1956) English
B.A., University of Denver, 1939; M.A., 1949; additional graduate study, University of Denver.
Experience: Advertising manager, Sterling (Colorado) Farm Journal; U. S. Army; instructor in Colorado and California public schools; instructor, Colorado School of Mines; associate professor, Central Missouri State College.

JOHNSON, MILES B. (1957) English
B.A., Gustavus Adolphus College, 1947; M.A., University of Minnesota, 1951; M.A., University of Denver, 1953; additional graduate study, University of Washington, University of Southern California.
Experience: Presidential assistant, Johnson Wholesale and Manufacturing Company; instructor and publications adviser, Florence State College; instructor and publications chairman, Memphis State University; instructor, University of Tennessee (ext.); assistant professor, Luther College; instructor, University of Puget Sound.

JOHNSON, RICHARD F. (1950) Animal Husbandry
B.S., Iowa State College, 1942; M.S., State College of Washington, 1947.
Experience: U.S. Army; instructor, College of Agriculture and assistant animal husbandman, Experiment Station, State College of Washington, Pullman, Washington.

JOHNSTON, ROBERT M. (1946-54) (1956) Mechanical Engineering
B.A., Santa Barbara State College, 1937; graduate study, Boeing School of Aeronautics.
Experience: Meteorologist, Pan American Airways and Pennsylvania Central Airlines; meteorology instructor, Randolph Field and Pan American Airways; junior civil engineer, Division of Highways, California.

JONES, CECIL W. (1939) Business Manager
Riverside College, 1934; Riverside Business College, 1936; Certificate International Accountancy Society, 1942.

Kellogg-Voorhis staff.
JONES, JOHN R. (1961) ................................................ Business Administration
B.S., University of Minnesota, 1931; LL.B., George Washington University, 1938.
Experience: Head, Social Science Department, Sedro Woolley, Washington Union High School; Identification Division, FBI; special agent, Public Works Administration; special agent, FBI.

JORGENSEN, EDWARD J. (1947) ..................................... Physical Education and Athletics
B.A., Chico State College, 1936; M.S., University of Southern California, 1950.
Experience: Instructor, physical education and industrial arts, South Fork, Ferndale, and Watsonville high schools; athletic director, Marin Junior College; officer, U.S. Navy.

JOSEPH, ROBERT F. (1961) ........................................ Medical Officer
Experience: General practice, Ross-Loos Medical Group, Pasadena; school physician, Los Angeles City School District.

JUDD, W. BOYD (1956) ............................................. Mathematics
B.S., St. Mary's College, 1939; M.A., University of California, 1951; additional graduate study, University of California.
Experience: High school teacher, California; instructor, Army specialized training program, University of Santa Clara; research mathematician, University of California; in charge of statistical operations, Bureau of Research and Guidance, Office of Los Angeles County Superintendent of Schools; I.B.M. supervisor, State of California, Department of Public Health; participant in National Science Foundation Institute, New Mexico State University.

KABAT, HERBERT R. (1952) ......................................... Physical Science
B.S., United States Naval Academy, 1938; M.A., Stanford University, 1951; additional graduate study, University of Southern California, Stanford University, University of Colorado.
Experience: Officer, U.S. Navy; research analyst, Rheem Mfg. Co.; instructor, Pasadena City College, College of the Sequoias.

KARCH, GEORGE P. (1958) ........................................... Physical Sciences
B.A., University of Iowa, 1926; Ed.M., University of Oklahoma, 1940; additional graduate study, University of Iowa, Oregon State College.
Experience: Teacher, Bartlesville Junior College and College High School; research, Phillips Petroleum Company; officer, U.S. Navy.

KAUFMAN, LOUIS (1961) ............................................ Business Management
B.S., University of California, Los Angeles, 1940; M.B.A., University of Southern California, 1961; D.B.A., 1963.
Experience: Instructor, University of Southern California; general manager, retail department, store chain; warehouse manager, plastics manufacturer; assistant plant manager, aluminum manufacturer and converter.

KAY, THOMAS D. (1958) ............................................. Machine Shop
B.S., Wayne State University, 1957.
Experience: Assistant training director, Ex-Cello-O Corporation; apprentice instructor, Chrysler Corporation; radio team chief and refrigeration mechanic, U.S. Army; machinist, Detroit-Timken Axle Company; apprentice, Goodyear Tire and Rubber Company.
KEECH, ROGER A. (1960) ........................................................................Mechanical Engineering
B.S., California State Polytechnic College, 1955.
Experience: Associate designer, Lockheed Aircraft; industrial engineer, Rocky
Mountain Arsenal, Denver; project engineer, Menasco Mfg., Burbank.

KEIF, RODNEY G. (1960) ........................................................................Air Conditioning and Refrigeration Engineering
B.S., Kansas State University, 1949; graduate study, California State Polytechnic
College.
Experience: Sales and application engineer, O'Connor-Okahama Company, Ok-
lahoma City; registered professional engineer, Oklahoma.

KELLER, ELMO A., JR. (1963) ..................................................................Mathematics
Experience: Assistant instructor, Brigham Young University; instructor, Church
College of Hawaii.

KELLY, EDWARD Y. (1957) ........................................................................Physical Sciences
B.S., Pennsylvania State College, 1943; M.S., 1945; Ph.D., Brown University, 1950.
Experience: Assistant professor, University of Maine; physicist, North American
Aviation; physicist, Rheem Manufacturing Co.

KENNEDY, ROBERT E. (1940) ................................................................. Vice President
A.B., San Diego State College, 1938; M.A., Stanford University, 1950. Additional
graduate study, Claremont University College.
Experience: Editorial staff of San Diego Sun, San Diego Daily Journal, San Luis
Obispo Telegram-Tribune, Palo Alto Times; executive secretary and manager, Civic
Affairs Conference, San Diego; advertising manager, Hamilton's Ltd., San
Diego; at California State Polytechnic College: instructor, English and journalism;
acting college librarian; instructor, communications and English, U.S. Naval Flight
Preparatory School; chairman, journalism department; public relations director and
publications adviser; assistant to the president; dean, Arts and Sciences.

KENNELLY, BRUCE (1947) ......................................................................Physical Sciences
B.S., University of Kentucky, 1944; M.S., Purdue University, 1946; Ph.D., Cornell
University, 1952.
Experience: Chemist, department of agricultural chemistry, Purdue University;
research chemist, department of biochemistry and nutrition, Cornell University.

KENNINGTON, MACK H. (1958) .................................................................Animal Science
B.S., University of Idaho, 1946; M.S., Purdue University, 1956; Ph.D., 1958.
Experience: U.S. Air Force; assistant agricultural extension agent, Bannock Com-
pany, Pocatello, Idaho; research assistant, Purdue University.

KENYON, PAUL (1957) .............................................................................Business Administration
LL.B., Southern Methodist University law school, 1949; M.A., California State
Polytechnic College, 1959.
Experience: Insurance legal staff, investment counseling, methods analyst, and
business systems and procedures analyst.

KESLER, CHARLES J. (1960) .....................................................................Mechanical Engineering
B.S.M.E., University of Michigan, 1941.
Experience: Works manager, Angle Products Company; consultant, McDonnell
Aircraft; design engineer, Convair; instructor, Case Institute of Technology; assistant
professor, Kent State University and University of Florida; associate professor, University of Missouri; registered professional engineer, Ohio.

KIBBE, DONALD E. (1958) .......................................................................Agricultural Engineering
B.S., California State Polytechnic College, 1956.
Experience: Manager, Surge of So. Oregon; salesman, Hawthorne Machinery,
San Diego; sales engineer, Service Equipment Supply Company, Rocklin.

* Kellogg-Voorhis staff.
KIEFER, DOROTHY L. (1962) ................................................. Physical Education
B.S., University of California, Los Angeles, 1943; graduate study, University of California, Los Angeles; University of California, Riverside; Claremont Graduate School.
Experience: Teacher, Huntington Beach High School, Riverside Polytechnic High School, Claremont High School.

KING, DONALD W. (1961) .............................................. Head, Civil Engineering Department
Experience: Instructor, Stanford University, San Jose State College, Engineer, Lockheed Aircraft, Sunnyvale; Aerojet-General, Covina; Western Knapp Engineering Co., New York; Hydrocarbon Research, New York. Engineer superintendent, Peter Kiewit Sons' Co., Arcadia.

KING, LOUIS J. (1958) .................................................... Psychology
B.A., University of California, Los Angeles, 1943; M.S.W., University of Southern California, 1954; Ed.D., 1958.
Experience: Marriage counselor, American Institute of Family Relations, Los Angeles; personnel counselor, Los Angeles; vocational and personal counselor, University of Southern California, Veterans Administration; instructor, Los Angeles City Schools, Torrance City Schools, Santa Ana Junior College; assistant superintendent, attendance and welfare, Los Angeles City Schools.

KINGSBURY, DAVE R., CAPT. U.S.A. (1963) ...................... Military Science
Experience: Troop assignments in Germany, Korea and Fort Benning, Georgia.

KIRKPATRICK, WILLIAM M. (1949-51) (1953) ............. Agricultural Engineering
B.S., California State Polytechnic College, 1949.

KITCH, KENNETH H. (1950) ........................................... Assistant to the President, Voorhis Campus
A.B., Southwestern College, 1930; A.M., Kansas University, 1937.
Experience: Reporting, editing, advertising staffs, various Kansas daily newspapers; instructor, community high schools, Arlington and Al kımont, Kansas; correspondent for Kansas City Star; editorial columnist for chain of southeast Kansas weeklies; instructor, Dallas, Texas, Technical High School; wire editor and writer, Associated Press; assistant director, Dallas Adult Education Program; public relations and advertising counsel, Dallas and San Antonio; news editor, WFFA, Dallas; editor and managing editor, Southern Seedsman and Sun-Up magazines; freelance magazine writer.

KNILL, LAMAR M. (1960) ............................................... Biological Sciences
B.S., Colorado State University, 1951; M.S., 1955.
Experience: Graduate assistant, Colorado State University; fellow, Squibb Institute for Medical Research; research physiologist, Veterans Administration Hospital, Albuquerque; training officer, Armed Forces Special Weapons Project, Sandia Base, New Mexico; technical representative, Braun Chemical Company, Los Angeles; officer, U.S. Army.

KNUDSEN, A. RUSSELL (1960) ....................................... Electronic Engineering
A.B., Brigham Young University, 1941; graduate study, North Carolina State College.
Experience: Instructor in electronics and mathematics, Valparaiso Technical Institute, Valparaiso, Indiana; assistant dean of education, Valparaiso Technical Institute; special instructor in electronics, Valparaiso University; instructor, National Science Foundation, Oklahoma State University; engineer, General Electric Co., Utica, N.Y.; staff member, Sandia Corporation, Albuquerque, New Mexico.

* Kellogg-Voorhis staff.
KOBERG, DONALD J. (1962) Architectural Engineering
B. of Arch., Tulane University, 1958.
Experience: Architectural practice as designer and draftsman in New Orleans; instructor, North Dakota State College; lecturer, University of California at Berkeley; research associate, Research Associates, Berkeley.

KOEHNEN, HARVEY E. (1963) Architectural Engineering
B.S., University of Illinois, 1951; M.S., 1952.

KOGAN, IRVIN J. (1957) Electronic Engineering
Experience: Instructor, Orange Coast College; U.S. Air Force.

KOMBRINK, RICHARD T. (1955) Mechanical Engineering
A.B., Loyola University, 1946.
Experience: Pilot, U.S. Army Air Corps; draftsman, Hess Greiner, and Polland; sales engineer, T. H. Creears Corp.; civil designer, City of Culver City; assistant project engineer, RCA Radar and Missile Division.

* KONIGSBERG, ALBERT (1961) Mathematics
B.S., U.S. Naval Academy, 1930; M.S., Purdue University, 1960.
Experience: Officer, U.S. Navy (retired); director of material, Pennsylvania Optical Company; instructor, Claremont Men's College.

KORSMEYER, RUSSELL (1958) Electrical Engineering
B.S.E.E., University of Missouri, 1950; M.S.E.E., University of Southern California, 1958.

* KRAMER, LLOYD A. (1963) Library
B.A., University of California, 1948; B.L.S., 1950; graduate study, U.S. Navy Language School.
Experience: Slavic librarian, Hoover Institute and Library; social sciences librarian, Washington State University; head, technical services division, Humboldt State College Library; director, technical services division, Pomona Public Library.

* KRIEGE, KENNETH B. (1957) Mathematics
B.S., California State Polytechnic College, 1951; M.A., 1951; additional graduate study, University of Southern California, University of California at Los Angeles.
Experience: Teacher, San Luis Obispo Junior High School, Pomona High School.

KROUTIL, WAYNE F. (1960) Agricultural Engineering
B.S., Oklahoma State University, 1954; graduate study, Oklahoma State University.
Experience: Engineering draftsman, John Deere Company; design engineer, International Harvester Co.; district sales manager, Modern Tractor and Supply Co.; teaching assistant, Oklahoma State University.

* LA BOUNTY, HUGH O. (1953) Executive Dean, Planning and Development
Experience: Teacher-administrator, Citrus High School and Junior College; chairman, English department and building coordinator; head, social science department, California State Polytechnic College.

* Kellogg-Voorhis staff.
LACY, MILO G. (1959) ........................................... Agricultural Business Management
BS., University of Oregon, 1938; graduate study, University of California, Los Angeles.
Experience: Instructor, Long Beach City College; Pasadena City College; retail marketing specialist, USDA, Washington, D.C.; general manager, Richards Market, Newport Beach.

LAMB, ROBERT S. (1962) ......................................... Library
Experience: Public information officer, U.S. Air Force; English teacher, Corpus Christi Joint Union High School, Los Altos High School; assistant librarian, Oakland Tribune.

LAMIMAN, JOHN F. (1946) .......................................... Biological Sciences
BS., University of California, 1922; M.S., 1924; Ph.D., 1931; additional graduate study, University of California.
Experience: S.A.T.C (Army) University of California; research assistant in entomology; instructor in entomology, University of California; entomologist in Experiment Station.

LANDRETH, James R. (1956) ....................................... Personnel Relations and Business Management Analyst
B.A., Mexico City College, 1954; M.B.A., Stanford graduate school of Business, 1956; additional graduate study, Claremont University College.
Experience: Instructor, U.S. Army; explosive ordnance disposal, U.S. Army; college personnel officer, assistant to dean of the college, California State Polytechnic College.

LANDYSHEV, ALEXANDER (1956) ................................. Electrical Engineering
E.E., University of Vladivostok, Russia, 1927.
Experience: Electrical engineer, Donetz Basin Power System, Russia; Energiebauost G.m.b.H., Germany; Brown-Voveri and Co., Germany; U.S. Army Engineers, Germany; U.S. Steel Corp., San Francisco; production engineer, Precision Manufacturing Co.; associate professor, University of California, Berkeley.

LANE, BERNARD O. (1963) ........................................... Physical Sciences
B.S., University of North Carolina, 1950; M.S., Brown University, 1955; Ph.D., University of Southern California, 1962.
Experience: Graduate assistant, University of Southern California; geologist, Union Oil Company; lecturer, University of Nevada; curator of paleontology, Mackay Museum; curator of geology, Santa Barbara Museum of Natural History.

LANGFORD, GORDON L. (1964) ..................................... Farm Management
B.S., Brigham Young University, 1962; M.S., Utah State University, 1963.
Experience: Research assistant, Utah State University; laboratory assistant, Brigham Young University.

LANGFORD, JAMES A. (1955) ..................................... Coordinator, Elementary Education
A.B., Western Kentucky Teachers College, 1937; M.A., 1947; Ph.D., University of Michigan, 1953.
Experience: Teacher in elementary and secondary schools in Kentucky; principal, Cromwell, Kentucky; principal, Jefferson Elementary School, Wayne, Michigan; assistant professor and supervisor of elementary education, University of Nevada; communications officer, U. S. N. R.

LANSDOWNE, JERRY W. (1963) ................................... Social Sciences
B.S., University of Wichita, 1953; M.A., 1959; additional graduate study, University of California at Los Angeles, University of Arizona.
Experience: Product Spec., O. A. Sutton Corp.; teaching assistant, University of Wichita; research assistant, Center for Urban Studies, University of Wichita; research assistant Bureau of Business and Economic Research, University of California at Los Angeles; teaching assistant, University of California at Los Angeles; teaching assistant and instructor, University of Arizona.

* Kellogg-Voorhis staff.
LASSWELL, MARCIA E. (1961) Social Sciences
B.A., University of California, 1949; M.A., University of Southern California, 1952.
Experience: Instructor, George Pepperdine College; consultant, Affiliated Psychological Consultants; marriage counselor and psychometric consultant, Institute Therapeutic Psychology.

LAUMANN, GEORGE C. (1957) Mathematics
A.B., Chico State College, 1952; M.A., 1953; additional graduate study, University of Oregon, University of California at Los Angeles.
Experience: Instructor, Ordnance Department, United States Army; teacher, California high schools; instructor, Adult Evening College, Chico; participant, National Science Foundation Institute, Portland State College.

LAWSON, JOHN D. (1951) Associate Dean (Activities)
Experience: Vocational instructor; officer, U.S. Navy; special supervisor, State Bureau of Agricultural Education.

LEACH, RICHARD (1930) Head, Poultry Industry Department
B.S., Montana State College, 1931.
Experience: Supervisor, feed sales agency, Sweet & Company, Bozeman, Montana; manager and owner commercial poultry plant, Bozeman, Montana.

LEBAY, E. LOUIS (1955) Agricultural Engineering
B.S., Michigan State University, 1953; M.S., 1955.
Experience: Research engineer, physics and metallurgy, Owens-Illinois Glass Co., Toledo, Ohio; concrete masonry construction supervision, Toledo, Ohio; management, orchard and general farming enterprise, southern Michigan.

LEYARD, ROBERT M. (1961) Agricultural Business Management
B.S., Miami University, 1942; B.S., Colorado State University, 1949; graduate study, California State Polytechnic College.
Experience: Loan officer, First National Bank of Arizona; farm real estate sales experience, Arizona; line officer, U.S.N.R., World War II.

LEE, THOMAS J. (1952) Physical Education and Athletics
Experience: Player-coach, All-American Professional Basketball Team; instructor, private gymnasium, Oakland; playground director, Hayward Recreation District; U.S. Army.

LEIGHTY, RAYMOND V. (1957) Soil Science
B.S., University of Maryland, 1938; M.S., 1940.
Experience: Supervisory soil scientist (Land Classification and Survey), USDA, Soil Conservation Service, Kentucky; party chief, SCS, Virginia, Georgia. U. S. Army, CE.

* LEVERING, DAVID L. (1963) Social Science
B.A., University of Redlands, 1950; M.A., Claremont Graduate School, 1959; additional graduate study, Claremont Graduate School.
Experience: Regional executive, World University Service; associate in humanities, University of California, Riverside.

A.B., University of Arkansas, 1933; M.A., Stanford University, 1950.
Experience: Office manager, Standard Brands Co.; business manager, Southern Pictorial News; personnel training supervisor, Lansburgh and Bros; officer, U.S. Navy; counselor, San Francisco Unified School District; associate dean (counseling and testing), California State Polytechnic College, San Luis Obispo.

* Kellogg-Voorhis staff.
<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Department/Specialization</th>
<th>Education and Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis, Vance D.</td>
<td>1946</td>
<td>Physical Sciences</td>
<td>A.B., University of California, 1933; M.A., 1940; Ph.D., University of Southern California, 1954; additional graduate study, University of New Mexico, University of Washington, Rensselaer Polytechnic Institute. Experience: Laboratory technician, Shell Development Company; science and mathematics instructor and administrator, California secondary schools; staff member, 1955 summer physics institute, University of New Mexico; U.S. Naval Aviation officer.</td>
</tr>
<tr>
<td>Lichtenstein, Stanley B.</td>
<td>1962</td>
<td>Audio-Visual</td>
<td>B.S., California State Polytechnic College, 1961; graduate study, University of Southern California. Experience: Teaching fellowship, University of Southern California.</td>
</tr>
<tr>
<td>Linder, Doris H.</td>
<td>1962</td>
<td>Social Sciences</td>
<td>A.B., Stanford University, 1946; M.A., 1949; Ph.D., University of Minnesota, 1961. Additional graduate study, McGill University; University of Oslo. Experience: Secondary school and adult education teacher, Sacramento, San Jose, Scandinavia; assistant professor, Education Department, San Jose State College; teaching assistant, History Department, University of Minnesota; instructor, History Department, Stanford University.</td>
</tr>
<tr>
<td>Lisowski, Martie L.</td>
<td>1959</td>
<td>Library</td>
<td>B.A., University of California, Los Angeles, 1933; M.S. in Library Science, University of Southern California, 1959. Experience: Counseling, testing, and special placement, California Department of Employment; evening school instructor, Los Angeles City Schools; library aide, Los Angeles County Library.</td>
</tr>
<tr>
<td>Lonnborg, Reynold H.</td>
<td>1946</td>
<td>Truck Crops</td>
<td>B.S., Agriculture, University of California, 1932. Experience: Vocational agriculture teacher at Downey and Santa Maria high schools; truck crops production and sales, Santa Maria Valley.</td>
</tr>
<tr>
<td>Loughran, Bernice B.</td>
<td>1958</td>
<td>Education</td>
<td>B.S., Newark State Teachers College, 1940; M.A., Ohio State University, 1946; Ed.D., Stanford University, 1958. Experience: Elementary school teacher, Southbury, Conn., Santa Barbara, California, and Redwood City, California; elementary art teacher, Irvington, New Jersey; art instructor, Johnson Teachers College, University of Connecticut and Danbury Teachers College.</td>
</tr>
</tbody>
</table>

* Kellogg-Voorhis staff.
LOWRY, JOHN J. (1962) ........................................ Mathematics
B.S., United States Military Academy, West Point, 1947; M.A., California State Polytechnic College, 1963.
Experience: Officer and navigation instructor, U.S. Air Force; engineer, Boeing Company.

LUKES, THOMAS M. (1962) ..................................... Food Processing
B.S., San Jose State College, 1947; M.S., University of California at Berkeley, 1949.
Experience: Microbiologist for Real Gold Citrus Products, Anaheim; laboratory supervisor, Gentry Division of Consolidated Foods, Gilroy.

LUM, PUEY-CHONG (1963) ..................................... Mathematics
Experience: Translator, California State Board of Examiners; teaching and research assistant in mathematics, University of California.

* LYNCH, EDMUND C., JR. (1963) .......................... Language Arts
B.A., University of Denver, 1955; M.A., 1956; additional graduate study, University of Denver.
Experience: Instructor, Trinity University; assistant professor and technical director of theater, Iowa State University; designer and technical director, Omaha Community Playhouse; operations supervisor, KOA, TV; instructor, University of Denver; film editor-operations director, WRC TV; lighting designer, Barter Theater of Virginia.

McCALEY, DONALD L. (1962) ............................... Public Relations Coordinator
B.S., Los Angeles State College, 1958; graduate study, Los Angeles State College.

* McCAMERON, LLOYD (1962) ............................ Library
Experience: Science teacher, Orangefield High School, Texas; Dalton High School, Georgia; librarian, U.S. Air Force, Okinawa; Armed Forces Medical Library; Pan American World Airways; U.S. Army, Alaska.

McCOMBS, JOHN W. (1960) ............................... Electronic Engineering
B.S., Clemson College, 1957; M.S., 1960.
Experience: Electrical design, drafting, service, for Greenwood (S.C.) Mills; instructor, Clemson College.

* McCORKLE, C. O. (1932) ............................. Dean of the College
B.S., University of California, 1927; M.S., 1937.
Experience: Director of agriculture and critic teacher, Red Bluff Union High School; executive secretary, California Association Future Farmers of America; teacher trainer, Agricultural Education, Bureau of Agricultural Education; head, agricultural division, California Polytechnic; research assistant, Giannini Foundation of Agricultural Economics, University of California; instructor, agricultural economics; subject matter specialist, Bureau of Agricultural Education, State Department of Education (California); assistant to the president, dean of instruction, administrative dean, instruction, California State Polytechnic College.

McCORKLE, ROBERT E. (1962) ......................... Agricultural Business Management
B.S., California State Polytechnic College, 1960; M.S., University of California, 1962.
Experience: Research statistician, Department of Agricultural Economics, University of California; research assistant, Farm Economics Division, Economic Research Service, United States Department of Agriculture.
McCORMIC, RALPH C. (1959)  
English and Speech  
B.A., Oklahoma State University, 1947; M.A., Stanford University, 1950; additional graduate study, Stanford University.  
Experience: Temporary instructor, Oklahoma State University; instructor, San Francisco State College; assistant professor, University of Texas; Command Entertainment Director, United States Army in Europe; technical director, Actor's Workshop of San Francisco.

McCULLY, HENRY HOWARD (1962)  
Biological Sciences  
A.B., Stanford University, 1931; Ph.D., 1961.  
Experience: Teaching assistant, Stanford University; marine biologist, California Department of Fish and Game; assistant professor, University of Idaho; instructor, A. & M. College of Texas; Lucerne Milk Co., Washington, D.C.; Swift and Company, Oklahoma City, Oklahoma; U. S. D. A. chemist, Oklahoma City, Oklahoma.

McELVENY, RICHARD B. (1963)  
Physical Education  
Experience: Graduate assistant, California State Polytechnic College; high school teacher, Sunnyvale.

McGLASSON, ELMER D. (1954)  
Dairy Manufacturing  
B.S., Oklahoma A. & M. College, 1947; M.S., University of Idaho, 1950.  
Experience: Assistant plant manager and in charge of quality control, Beatrice Foods, Oklahoma City, Oklahoma; agriculture instructor, Guthrie, Oklahoma; research assistant, University of Idaho; assistant professor, University of Idaho; instructor, A. & M. College of Texas; Lucerne Milk Co., Washington, D.C.; Swift and Company, Oklahoma City, Oklahoma; U. S. D. A. chemist, Oklahoma City, Oklahoma.

McGRATH, JAMES M. (1946)  
Head, Air Conditioning and Refrigeration Engineering Department  
B.A., Santa Barbara College, 1941; M.A., California State Polytechnic College, 1953.  

McGRATH, THOMAS H. (1956)  
Dean of Students  
B.A., Santa Barbara College, 1941; M.A., Claremont Graduate School, 1946; additional graduate study, Claremont Graduate School, University of Southern California.  
Experience: Senior instructor, Air Force Instructors' Technical School, Chanute Field, Illinois; teacher, Los Angeles City Schools; curriculum specialist, State Department of Education, Division of Secondary Education; instructor of psychology and acting dean of men, Mt. San Antonio College; visiting lecturer in education, Claremont Graduate School; instructor of psychology, California State Polytechnic College, K-V Campus; research psychologist and head Training Materials Research Section, U.S. Navy Electronic Laboratory, San Diego; assistant to the president, Kellogg-Voorhis Campus.

McINTOSH, WILLIAM C. (1951)  
Coordinator, Scheduling and Institutional Studies  
A.B., University of California, Berkeley, 1948; M.A., 1950; additional graduate study, University of Southern California.  
Experience: Teacher, Richmond Union High School; mathematics and physics instructor, California State Polytechnic College, San Luis Obispo Campus; instructor, mathematics, California State Polytechnic College, Kellogg Campus.

McKNIGHT, ROBERT V. (1963)  
Head, Technical Journalism Department  
B.J., University of Missouri, 1948; M.S., Northwestern University, 1960.  
Experience: Public relations, Army Air Force; managing editor, Daily News, Neosho, Missouri; director of public relations, Kansas State College; reporter, Kansas City, Missouri, Star; assistant professor of journalism, Texas Women's University; information specialist, State Extension Service, University of Arizona.

Kellogg-Voorhis staff.
* McLACHLIN, HARRY B. (1954) __ Head, Animal Sciences Department
  B.S., North Dakota State College, 1930.
  Experience: Extension service, extension animal husbandman, North Dakota; U.S.
  Navy; ranch management, Sacramento Valley.

McLNN, DOROTHY (1956) __ Business Administration
  University of California at Santa Barbara.
  Experience: Accountant, Grand Central Airport, Glendale, general and special
  accounting, including systems and audits; certified public accountant.

McMEEN, GEORGE H. (1960) __ Mathematics
  B.A., Western Washington College of Education, 1934; M.Ed., University of
  Experience: Elementary, junior high, junior college, and state college teaching;
  air navigation officer, U.S. Navy; professor and chairman, mathematics department,
  Newark State College, Newark, New Jersey; Special Consultant in Mathematics,

* McMILLAN, JOHN C. (1962) __ Electronic Engineering
  Experience: Communications electronics staff officer, U.S. Air Force; senior
  electronics engineer and group leader, General Dynamics; chief engineer, Fidelity
  Instruments.

McMORRAN, WAYNE E. (1962) __ Electronic Engineering
  B.S., California State Polytechnic College, 1960; M.S.F.E., New York University,
  1962.
  Experience: Technician, Western Electric Company, Shell Development Com-
  pany; member of the technical staff, Bell Telephone Laboratories, Murray Hill,
  New Jersey.

McRAE, GLENN G. (1963) __ Counselor
  Experience: Graduate assistant, fellow, teaching assistant, University of Florida;
  instructor, St. Petersburg Junior College; visiting summer lecturer, Mississippi State
  University, Louisiana State University, Northwest Louisiana State College, and
  State College of Iowa.

McROBBIE, J. M. (1962) __ Head, Technical Arts Department
  A.B., San Jose State College, 1950; M.A. San Diego State College, 1955; Ed.D.,
  Experience: Template and patternmaker, The Boeing Company, Seattle; in-
  structor and civilian personnel recruiter, Puget Sound Naval Shipyards, Bremerton;
  industrial arts teacher, Santa Clara County; industrial arts teacher-consultant, San
  Diego County Schools; coordinator of industrial arts, Tulare County Schools.

* MACDONALD, KENNETH A. (1962) __ Mathematics
  B.A., University of Arizona, 1956; M.A., University of Vermont, 1958.
  Experience: Instructor, Idaho State College; Instructor, San Diego State College.

MACH, GEORGE R. (1954) __ Mathematics
  B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951;
  Ph.D., Purdue University, 1963.
  Experience: National Science Foundation faculty fellow, Purdue University;
  graduate teaching assistant, Purdue University; officer, U.S. Navy.

* MACROPOL, JOHN (1960) __ Physical Sciences
  B.A., University of California, 1954; M.S., Michigan State University, 1955.
  Experience: Dynamics engineer, Convair, San Diego; head, physics department,
  Lawrence Institute of Technology, Detroit, Michigan.

* Kellogg-Voorhis staff.
MAGER, HANS L. (1940) Architectural Engineering
Experience: Lecturer, Railway Engineering School; constructor of railway bridges, administration of Estonian Railways; structural engineer, Building Concern H.S.B., Stockholm, Sweden. Registered professional engineer, California.

MAGUR, LEON W. (1958) Physical Sciences
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College.
Experience: Electronic technician.

MAKSOUIDIAN, Y. LEON (1963) Mathematics
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961.
Experience: Instructor, Westmont College, Northwestern College; teaching assistant and instructor, University of Minnesota; junior development engineer, Minneapolis Honeywell Company.

MANNING, JOHN H. (1956) Mathematics
A.B., Oakland City College, 1937; M.A., University of Cincinnati, 1939; D.Ed., Pennsylvania State University, 1954.

MARQUEZ, HENRY B. (1955) Business Service Officer
B.S., University of California, Los Angeles, 1952.
Experience: Manager, Thrifty Drug Stores, Inc.; assistant to secretary-treasurer, Cannell and Chaffin; medical section, Los Angeles Terminal Annex Post Office; U. S. Coast Guard; purchasing division, Los Angeles County Purchasing and Stores; Bureau of Engineering, City of Los Angeles.

*MARSHALL, ROBERT D. (1957) Library
A.B., University of Washington, 1940; B.L.S., University of California, 1953.
Experience: Social science librarian, University of Oregon.

MARSTON, ENA LESLIE (1946) English
A.B., Mills College, 1927; A.M., 1928; A.M., Radcliffe College, 1931; additional graduate study, Universities of California, Washington, and Chicago.
Experience: Instructor and administrator at junior colleges in Oregon and Pennsylvania; instructor, Washington State College; assistant professor, Lewis and Clark College.

*MARTI, WERNER H. (1956) Social Sciences
A.B., University of California, Los Angeles, 1943; M.A., Claremont Graduate School, 1951; Ph.D., University of California, Los Angeles, 1953.

MARTINSON, MARJORY E. (1955) Home Economics
B.S., University of Missouri, 1931; M.A., 1939; additional graduate study at University of Chicago and University of California at Los Angeles.
Experience: Vocational home economics teacher, high schools, Missouri; supervising teacher, University of Missouri; teacher trainer, Northwest Missouri State College; lecturer, University of Hawaii; assistant state supervisor of home economics, Iowa State Board of Vocational Education; associate professor, The Stout Institute; teaching assistant, University of California at Los Angeles.

*MATHAN, GERDA (1963) Biological Sciences
Experience: Teacher, San Leandro High School; teaching assistant, University of California; instructor, Mills College, Oakland City College, San Francisco College for Women.

* Kellogg-Voorhis staff.
MATHENY, ROBERT (1952) ............................. Agricultural Engineering Technical Certificate, California State Polytechnic College, 1951.

Experience: International Harvester Company, Des Moines, Iowa; diesel and heavy duty machinery mechanic, Army Air Corps; dealer and sales, Allis-Chalmers, Point Arena.

*MAURER, ROBERT L. (1948) ......................... Dean, Arts and Sciences Division
B.A., Western Reserve University, 1935; M.A., 1936; Ph.D., Ohio State University, 1951.

Experience: Teaching assistant and research fellow, Ohio State University; instructor, Oregon State College, San Luis Obispo Campus of California State Polytechnic College; officer, U. S. Air Force; California certified psychologist.

*MAURY, JAMES B., JR. (1963) .......................... Accountancy
B.S., University of Utah, 1959; graduate study, Loyola Law School.

Experience: Teacher, Twin Falls, Idaho; Junior High School; staff accountant, Alexander Grant and Company; staff accountant, Darling Wold and Agee. Certified public accountant.

*MELLARD, GEORGE A. (1957) .......................... Electronic Engineering
B.S., Kansas State College, 1947; M.S., 1952.

Experience: Instructor, Kansas State College; senior resident engineer, Convair, Pomona; engineer, Sylvania, Mountain View; officer, U. S. Naval Reserve.

MERRIAM, JOHN L. (1958) ............................. Agricultural Engineering
B.S., California Institute of Technology, 1938; graduate study, California Institute of Technology.

Experience: Instructor, California Institute of Technology; junior civil engineer, U. S. Army Engineers and private consulting engineers; civil area engineer, Soil Conservation Service, USDA; senior irrigation engineer, Ministry of Agriculture, Kingdom of Saudi Arabia; registered civil engineer, California.

MERSON, JAMES F. (1936) ............................. Head, Agricultural Engineering Department
B.A., San Jose State College, 1932; graduate study, University of California, Colorado State College.

Experience: Instructor, agricultural mechanics, Dos Palos and Santa Rosa high schools.

MESLER, FLORENCE (1962) ............................. Graduate Nurse
R.N., Patterson General Hospital, New Jersey, 1939.

Experience: Industrial nurse, Wright Aero Corporation, Patterson, New Jersey; general duty nurse, Santa Monica Hospital, and French Hospital, San Luis Obispo; private duty, San Luis Obispo.

MEYER, THOMAS O. (1955) ............................. Food Processing
B.S., State College of Washington, 1949; M.S., 1953.

Experience: Instructor and meats specialist, State College of Washington; assistant animal husbandman, Experiment Station, State College of Washington, Pullman, Washington.

*MILES, RICHARD L. (1962) ............................ Business Management

Experience: Business experience in food retailing; life insurance agent; petroleum marketing; owner-manager of restaurant; instructor, Ganesha High School.

*MILLER, ALFRED I. (1963) ............................ Physical Education
B.S., California State Polytechnic College, 1963; graduate study, California State Polytechnic College.

Experience: Athletic coach, Webb School of California, Claremont.

Kellogg-Voorhis staff.
MILLER, ALLEN D. (1960)  Mathematics
B.S., Iowa State University, 1945; M.S., 1948; Ph.D., 1953.
Experience: High school mathematics teacher, Iowa, Nebraska, Wisconsin, and California; college mathematics teacher, Wisconsin, Illinois, Iowa and California; research development in industry, Hughes Aircraft Company; participant in National Science Foundation institutes, Stanford University, Bowdoin College, University of Arizona, University of Southwest Louisiana.

MILLER, DOUGLASS W. (1953)  Publications Manager
B.A., DePauw University, 1916; M.A., University of Wisconsin, 1927; Litt.D., DePauw University, 1941.
Experience: Copywriter, Sidner-Van Riper Advertising Agency; editorial staff: Greencastle, Ind., Daily Banner; European Edition, Stars and Stripes; community newspaper publisher, Syracuse, N.Y., Los Angeles; director of public relations, Ohio Wesleyan University, Syracuse University, Case Institute of Technology; professor of journalism, Ohio Wesleyan University, Stanford University, Syracuse University.

MILLER, JEANNE (1961)  Graduate Nurse
R.N., St. Alexius Hospital, Bismarck, North Dakota, 1944.
Experience: Mountain View Hospital and French Clinic, San Luis Obispo.

MILLER, LOUIS C. (1960)  Aeronautical Engineering
B.S., Massachusetts Institute of Technology, 1928.
Experience: Administrative, design, and test engineering in aerodynamics and flight testing for Boeing, Douglas, Northrop, Consolidated-Vultee, Goodyear, Wright, Brewster, and Curtis aircraft companies.

MIXON, THOMAS B. (1956)  Mechanical Engineering
B.S., Southwestern Louisiana Institute, 1930.
Experience: Officer, U.S. Air Force, including assignments as: engineering officer, test pilot, B-29 commander, director of training at Yuma, Arizona, and director of maintenance at Las Vegas, Nevada.

MOE, DAVID E. (1957) (1963)  Physical Sciences
Experience: Instructor, University of Kansas City; research associate, Washington University; assistant professor, Western Reserve University; instructor, mathematics, California State Polytechnic College.

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.
Experience: Laboratory assistant and teaching assistant, California State Polytechnic College; teaching fellow, College of the Pacific; staff Pacific Marine Biological Station, Dillon Beach, California; National Science Foundation fellow, Friday Harbor Laboratories; National Science Foundation fellow, University of California.

* MOORE, DOUGLAS H. (1958)  Mathematics
A.B., 1942; University of California, M.A., 1948; Ph.D., 1962.
Experience: U.S. Air Force, instructor, University of California, West Coast University, Los Angeles; research engineer, North American Aviation, Hughes Aircraft Company, Los Angeles.

* MORALES, RAY (1961)  Civil Engineering
B.S., Loyola University, 1960; M.S., Stanford University, 1961.
Experience: Assistant civil engineer, Department of Water and Power, Los Angeles; field engineering aide, Department of Water and Power, Los Angeles; design draftsman, Electro-cord Corp.; design draftsman, Williams Metal Products; assembly, Lockheed Aircraft Corp.

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MORAN, GABRIEL T. (1948) _________________________ Physical Sciences
B.A., Whittier College, 1942; graduate study, Whittier College.
Experience: Chemist, American Potash and Chemical Company, Trona; Thompson Products, Bell; Paul Dickerson, Chemistry Laboratory; District Agricultural Laboratory, Whittier.

MORGAN, HORATIO O. (1963) Aerospace Engineering
B.A., Pomona College, 1928; graduate study, Claremont College, George Washington University.
Experience: United States Air Force as group commander, executive officer, commander air base group, air inspector, personnel officer; director personnel, Boston Air Defense Sector; colonel (retired) U.S. Air Force.

MOTT, ROBERT A. (1946) Physical Education
B.S., University of Akron, 1938; M.A., University of Southern California, 1946; Ed.D., Stanford University, 1953.
Experience: Physical education instructor and athletic coach, Akron Public School System; officer, U.S. Navy; teaching assistant, University of Southern California; visiting professor University of Colorado.

MOUNTS, BILLY W. (1956) College Physician
M.D., Georgetown University, Washington, D.C., 1950.
Experience: Internship, Fitzsimons General Hospital, Denver; residency, San Luis Obispo General Hospital; four years private practice, Pismo Beach.

MOWATT, WARREN P. (1961) Mechanical Engineering
B.S., U.S. Naval Academy, 1925; graduate study, University of California, Berkeley; U.S.N.A. Post Graduate School, University of Wisconsin.
Experience: Assistant professor, Tennessee Polytechnic Institute, Cookeville, Tennessee; captain (retired), U.S. Navy.

MULDER, GEORGE (1960) Counselor
B.A., Long Beach State College, 1956; M.A., 1957; additional graduate study, University of Southern California.
Experience: Teacher, Excelsior Union High School District; counselor-instructor, Cerritos College; Electronic technician, U.S. Army Ordnance; drafting, tool design, and technical illustration, Goodyear Tire and Rubber and Shaffer Tool Company.

MURRAY, MARY ETTA B. (1956) Associate Dean (Women)
B.A., University of Southern California, 1937; M.A., 1938; Ph.D., 1960.
Experience: Instructor, San Bernardino High School; head of language department; El Monte High School; associate dean (women), California State Polytechnic College, San Luis Obispo.

Experience: Platoon Sergeant, Infantry Regiment in Korean Campaign; Platoon Sergeant in Germany during occupation duty; Platoon NCO, Battle Group, Fort Lewis, Washington.

MYLАНDER, HARVEY (1958) Mechanical Engineering
B.S.M.E., University of Arizona, 1931; graduate study, University of Arizona, 1932.
Experience: Junior engineer, U.S. Geological Survey; foreign representative, General Electric Company; Pacific Coast manager, American Hoist and Derrick Company; district manager, DeLaval Steam Turbine Co.; consulting hydraulic engineer, private practice; registered professional engineer, California.

NEEL, PAUL R. (1962) Architectural Engineering
B.S., California State Polytechnic College, 1958; B. of Arch. University of Southern California, 1962.
Experience: Designer-draftsman, W. D. Concolino, Monterey, and Jones and Emmons, Los Angeles. Registered architect, State of California.

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NEELANDS, JAMES G. (1957) ........................................... Equipment Technician, Applied Sciences
B.S., California State Polytechnic College, 1956; additional graduate study, University of Washington.
Experience: Teaching assistant and research assistant, University of Washington; naval aviator and officer, U.S. Marine Corps.

NELSON, CARL RUSSELL (1949) ........................................ Dairy Husbandry
B.S., Kansas State College, 1941; M.S., University of Missouri, 1958.
Experience: Instructor, Kansas State College; supervisor, dairy herd and farm management association, Kansas; extension agent, extension dairyman, Kansas; dairy inspection, U.S. Public Health Service; U.S. Army.

NELSON, DONALD S. (1943) ........................................... Business Manager
A.B., Stanford University, 1930.
Experience: California State Department of Finance, Budgets and Accounts; comptroller, Fresno State College.

NELSON, EDWARD A. (1958) ........................................... Animal Science
B.S., Utah State Agricultural College, 1952; M.S., 1953; Ph.D., Kansas State College, 1958.
Experience: Manager, B.A.C. Valley Farm, Cedar City, Utah; co-owner and operator of livestock ranch, Cedar City, Utah; graduate research assistant, Kansas State College; U.S. Navy.

NELSON, RICHARD F. (1960) ........................................... Biological Sciences
B.S., Brigham Young University, 1955; M.S., 1957; Ph.D., State University of Iowa, 1960.
Experience: Teaching assistant, Brigham Young University, State University of Iowa; research associate in radiation biology, State University of Iowa.

NELSON, RICHARD T. (1961) ........................................... Business Management
Experience: Operations control analyst, Aerojet-General Corporation; management and traffic consultant; assistant traffic manager, Treesweet Products Company; proprietor of retail grocery.

NEWELL, LLOYD A. (1956) ........................................... Agricultural Services and Fruit Industries
B.S., South Dakota State College, 1941.
Experience: Agricultural inspector, Department of Agriculture, San Diego County; instructor I-on-F program, Escondido and El Cajon; instructor adult education, Escondido; deciduous orchard manager, Escondido; livestock superintendent, San Diego, Riverside, and Orange County Fairs; U.S. Marine Corps.

NICHOLSON, LOREN L. (1956) ........................................... Journalism and Publications
A.B., San Jose State College, 1946; M.B.A., Stanford University, 1947; additional graduate study, Stanford University.
Experience: Advertising sales representative, Watsonville Register-Pajaronian; advertising sales correspondent, Sunset Magazine; advertising director, Redding Record-Searchlight.

NIELSEN, KEITH E. (1959) ........................................... English
B.A., Alma College, 1953; M.A., Stanford University, 1959; additional graduate study, Stanford University.
Experience: U.S. Marine Corps; welder; power plant engineer, farmer, neuropsychiatric nursing assistant, U.S. Veterans Administration Mental Hospital; ranger-naturalist, National Park Service; high school teacher, Laingsburg, Michigan.

*NISE, NORMAN S. (1963) ........................................... Electronic Engineering
B.S.E.E., Drexel Institute of Technology, 1960; M.S.E.E., Lehigh University, 1962; additional graduate study, Purdue University.
Experience: Part-time instructor, Purdue University; Remington Rand Univac; electronics engineer, Hughes Aircraft Company.

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NOBLE, GLENN A. (1947) ___________________________ Head, Biological Sciences Department  
A.B., University of California, 1931; M.A., 1933; Ph.D., Stanford University, 1940.  
Experience: Assistant in zoology, College of the Pacific; instructor, San Francisco  
City College; consultant in biology, American Military Government in Korea; pro-  
fessor of parasitology, Seoul National University, Korea; Fulbright professor of  
parasitology, Philippines and Taiwan.

NOLAN, THOMAS F. (1949) .. Social Sciences  
B.S., University of Wisconsin, 1935; M.A., University of Southern California,  
1940; additional graduate study at the University of Zurich, Switzerland.  
Experience: Instructor senior high school, Stockbridge, Wisconsin; instructor  
senior high school, Kaukauna, Wisconsin; instructor, American School, Quito,  
Ecuador; Economic Analyst, Department of State, Washington, D.C., Montevideo,  
Uruguay; Officer, U.S. Naval Reserve; Vice-Consul, Department of State, Wash-  
ington, D.C. at Valparaiso, Chile.

NOORZOY, MOHAMMED S. (1963) -- Social Sciences  
B.A., 1957, University of California; M.A., 1960; additional graduate study, Uni-  
versity of Washington.  
Experience: Reader and instructor, University of Washington; research assistant,  
Federal Reserve Bank, San Francisco.

O'DANIELS, HOWARD R. (1933) . . . Business, Physical Education  
Bachelor of Commercial Science, University of Santa Clara, 1931; additional  
graduate study, University of Southern California.  
Experience: Coach, California Polytechnic; officer, U.S. Navy.

OGREN, JOHN R. (1960) .................................. Physical Sciences  
B.S., Northern Michigan College, 1955; M.S., Iowa State University of Science  
and Technology, 1957; additional graduate study, Case Institute of Technology,  
University of California, State University of Iowa.  
Experience: Physicist, Ames Laboratory of the Atomic Energy Commission;  
assistant professor, Northern Michigan College.

O'LEARY, MICHAEL J. (1951) .................................. Social Sciences  
Experience: Property accountant, U.S. Marine Corps Supply Depot; instructor  
and examiner-specialist, Air Force Radar Technical School; instructor, U.S. Armed  
Forces Institute.

OSTEYEE, LEON F. (1957) .................. Head, Mechanical Engineering Department  
B.M.E., Rensselaer Polytechnic Institute, 1945; M.M.E., 1957.  
Experience: Instructor, Rensselaer Polytechnic Institute; designer, General Elec-  
tric Company; American Locomotive Co.; ship superintendent, U.S. Naval Shipyard,  
Bremerton, Washington; registered professional engineer, California and New York.

OVERMEYER, PHILIP H. (1958) .................. Business Administration  
B.S., University of Oregon, 1931; M.S., 1936; Ph.D., University of Minnesota,  
1939.  
Experience: High school instructor; teaching fellow, University of Minnesota;  
assistant professor, University of Alabama; federal administrator, WCIC of the  
National War Labor Board; lecturer, De Paul University; professor, Lewis and  
Clark College; private arbitrator, labor disputes; public member, Region XIII, Wage  
Stabilization Board; regional director, Office of the Salary Stabilization; co-ordina-  
tor of Instruction, Golden Gate College San Francisco; Professional Lecturer.

OZAWA, KENNETH (1963) .................. Physical Sciences  
B.S., John Carroll University, 1959; M.S., 1960; additional graduate study, Texas  
A & M.  
Experience: Graduate assistant and instructor, John Carroll University.

PAGE, PERRYMAN L. (1963) .................. Library  
B.A., University of Mississippi; M.S.L.S., Louisiana State University, 1963.  
Experience: U.S. Air Force; Louisiana State University Library.
* PARISH, RUSSELL (1958) Chairman, Metal Processes Department  
B.S., 1932, Oshkosh State Teacher's College, Wisconsin.  

PATTISON, JOAN (1962) Physical Education  
B.S., Boston University, Sargent College, 1954; M.A., Columbia University, 1957.  
Experience: Madison, New Jersey; Chappaqua, New York; College of William and Mary.

* PAUGSTAT, WILLIAM C. (1956) Mathematics  
A.B., Miami University, 1952; M.Sc., Cornell University, 1954.  
Experience: Assistant professor of chemistry, Upland College; associated with the Exchange Orange Products Company, Ontario, as hesperidin analysis and control chemist.

* PAUL, FRANK (1960) Accounting  
B.B.A., City College of New York, 1942; M.A., University of San Francisco, 1958; additional graduate study, City College of New York, University of Washington.  

PAUTZ, ROLAND K. (1959) Poultry Industry  
B.S., Oregon State College, 1957; graduate study, Oregon State College.  

* PEARLSTEIN, NED C. (1963) Social Sciences  
B.A., Claremont Men's College, 1951; M.A., Claremont Graduate School, 1958; additional graduate study, University of California.  
Experience: U.S. Army; research assistant, Institute of Industrial Relations, Berkeley; instructor, College of the Holy Names; research associate, California Medical Association.

PEDERSON, WILLARD M. (1961) English  
A.B., Colorado Western State College, 1937; M.A., Colorado State College, 1938; additional graduate study, Colorado State College, Western Reserve University, Colorado State University.  
Experience: English teacher and football coach, Shaker Heights High School, Cleveland, Ohio; English instructor, football coach and athletic director, Mount Union College; associate professor and director of athletics, Marshall College; associate professor and athletic coach, Colorado Western State; professional athletics; officer, Navy Underwater Demolition.

* PENALOSA, FERNANDO (1959) Acting Head, Social Sciences Department  
Experience: U.S. Army; Mexican Army; cataloger, University of Chicago Library; junior librarian, Alameda County Library, Oakland; cataloger and head of technical processes, Fresno State College Library; assistant professor, University of Southern California.

PENICK, JAMES L. (1963) Social Sciences  
Experience: U.S. Navy; research assistant, College of William and Mary; teaching assistant, research historian, University of California; instructor, University of Maryland.

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* PENROD, WM. HENRY (1958) .............................................Welding Shop
Purdue University.
Experience: Welder, Doak Aircraft Company; welder, Hardmann Tool and
Engineering Company; welding supervisor, Precision Sheet Metal; welding super-
vvisor, Airite Products, Inc.

PERELLO, DOMINIC B. (1954) ........................................Social Sciences
A.B., University of California, Santa Barbara College, 1951; M.S., University of
Wisconsin, 1952; additional graduate study, University of California at Los Angeles.
Experience: Officer, U.S. Air Force; partner, Perello and Sons; teaching assistant,
University of California at Los Angeles.

PETERS, JAMES M. (1958-60) (1963) ........................................Physical Sciences
A.B., University of California, 1953; Ph.D., 1957.
Experience: Biochemist, University of California; instructor, California State
Polytechnic College; biochemist, Baltimore City Hospitals; assistant professor,
University of Maryland.

* PFLUEGER, DONALD HOWARD (1952) (1958) ................Social Sciences
B.A., Pomona College, 1949; M.A., Stanford University, 1951.
Experience: U.S. Navy; teacher, Covina High School; instructor, California State
Polytechnic College; cultural attaché, American Embassy, Amman, Jordan.

PHAKLIDES, WILLIAM J. (1963) ........................................Air Conditioning and Refrigeration Engineering
B.S., California State Polytechnic College, 1956.
Inc., Modesto; design engineer, Barium Products, Ltd., Modesto; design engineer,
Conditioned Air, Fresno.

PHILBIN, LEO F. (1948) ............................................Aeronautical Engineering
B.S., California State Polytechnic College, 1944.
Experience: Aircraft instructor, Naval Flight Preparatory School; aircraft in-
structor, Fourth Air Force Headquarters, San Francisco; civilian training admin-
istrator, Salinas Army Air Base; training officer, Veterans Administration Office,
San Luis Obispo; registrar, California State Polytechnic, San Luis Obispo.

* PHILBRICK, JOSEPH L. (1960) ....................................Social Sciences
B.A., Baylor University, 1949; M.A., 1950; Ph.D., 1955; additional graduate
study, University of Southern California, Long Beach State College.
Experience: Elementary school; registrar and chairman of department of psy-
chology and philosophy, California Baptist Theological Seminary; dean of student
personnel services, chairman of department of psychology and philosophy, Howard
Payne College; instructor in psychology and sociology, Fullerton Junior College;
instructor in philosophy, Cerritos College; instructor in education, University of
California Extension.

PHILLIPS, WILLIAM R. (1957) ........................................Architectural Engineering
B.Arch., University of Southern California, 1952.
Experience: Draftsman, W. H. Harrison, Architect; Sponseller & Sons; U.S.
Engineer Department; engineer, North American Aviation, Inc.; U.S. Army;
registered architect, California.

* PIATT, JAMES H. (1962) .............................................Business Management
Experience: Intern, Legal Aid Program, Los Angeles; Nichols, Stead, Boileau
and Lamb, Attorneys; officer and instructor, U.S. Army.

* PILLSBURY, KENT L (1962) ........................................Social Sciences
A.B., University of California at Santa Barbara, 1938; M.A., University of Oregon,
1939; Ed.D., Columbia University, 1950.
Experience: Associate professor, Arizona State University; chairman, department
of philosophy, Wisconsin State College, Eau Claire; instructor, Los Angeles City
Schools.

* Kellogg-Voorhis staff.
PIMENTEL, RICHARD A. (1952) ------------------------------- Biological Sciences
A.B., San Jose State College, 1947; M.S., Oregon State College, 1950; Ph.D., 1952.
Experience: Officer, U.S. Army; teaching assistant, Oregon State College; ranger-
naturalist, Crater Lake National Park; associate professor, University of California
Extension Nature Study Institute at Santa Barbara; lecturer, National Science
Foundation Summer Science Program.

* PITKIN, WILLIS L., JR. (1961) ------------------------------- English
Experience: Teaching assistant and lecturer, University of Southern California.

POLLEY, RUDOLPH A. (1952) ------------------------------- Architectural Engineering
A.B., University of California, 1927.
Experience: Draftsman and designer with architects in San Francisco and Santa
Barbara; architect engineer for Santa Barbara County, Hancock College, and U.S.
Government; private practice as architect in Oxnard; registered architect, Cali-
ifornia.

* POLLOCK, FRANCES (1963) ------------------------------- Language Arts
A.B., University of California, 1943; M.A., University of California at Los
Angeles, 1959; additional graduate study, University of Southern California, Neighbor-
hood Playhouse School of the Theater, New York.
Experience: Instructor, Hartnell College, Salinas; managing-director, Community
Players, Berkeley; partner-producer, Gallery Stage, Hollywood; summer stock,
New York, New Hampshire.

PRICE, BYRD L. (1957) ------------------------------- English
B.A., Baylor University, 1927; M.A., 1932; additional graduate study, Harvard
University, University of Colorado, University of California.
Experience: Assistant professor, Texas A. & M. College; assistant professor, San
Jose State College; instructor, Modesto Junior College.

PRICE, CLIFFORD J. (1956) ------------------------------- Aeronautical Engineering
B.S., University College, South Wales, 1932.
Experience: Lecturer, Municipal College, England; South African Air Force
School of Technical Training; Pretoria Technical College, South Africa. Chief
technical officer, South African Air Force School; Major, South African Air Force;
chief inspector of aircraft accidents and aircraft materials; head of Aircraft Acci-
dent Investigation Branch, Division of Civil Aviation, Union of South Africa. In-
structor, Northrop Aeronautical Institute.

PRICE, D. JOHN (1957) ------------------------------- Mechanical Engineering
National Certificate in M.E., Dudley and Staffordshire Technical College, 1950;
B.S., California State Polytechnic College, 1954.
Experience: Engineer, British Electricity Authority; assistant planning engineer,
British Columbia Telephone Co.; technical assistant, Vickers Armstrong Ltd.; offi-
cer, RCAF.

B.S., University of Georgia, 1953; graduate, armor officers' associate course and
armor officer career course, Fort Knox, Kentucky; armor officer communication
course, Fort Hood, Texas; air-ground operations course, Ramstein, Germany.
Experience: U.S. Army Air Force; U.S. Army, armor and cavalry unit officer;
staff officer, armor and cavalry units; company commander, armored company;
served in Alaska and Europe.

* PROCSAL, ROBERT L. (1949) ------------------------------- Head, Agronomy Department
B.S., California State Polytechnic College, 1946.
Experience: Borden's Dairy Delivery Service, Oakland; vocational agricultural
instructor, El Centro; diversified farming, Imperial County; officer, U.S. Army Air
Force.

* Kellogg-Voorhis staff.
*PURDY, ALAN H. (1961) ______________________________________ Mechanical Engineering
B.S.M.E., University of Miami, 1954.
Experience: Project engineer, AC Spark Plug, Flint, Michigan; instructor, Mott Foundation, Flint; project engineer, Arvin Industries; engineer and draftsman, Tool Engineering Specialist; turret lathe operator, Chicago Pneumatic; electronic technician, W. C. Robinette Co.; special project engineer, Consolidated Engineering, Pasadena; draftsman, Master Engineer, Detroit.

*PYE, EARL L. (1961) ______________________________________ Physical Sciences
A.B., Chico State College, 1958; M.S., University of California, Davis, 1961.
Experience: Teaching assistant and laboratory technician, University of California; laboratory technician, Standard Oil Company of California; insurance investigator, Retail Credit Company, and self-employed, dba Statistical Research.

*QUANEY, ROBERT (1959) ______________________________________ Industrial Engineering
B.S.I.E., Stanford University, 1954; graduate study, University of California.
Experience: Manufacturing engineer, R.C.A., Los Angeles; manufacturing planner, Lockheed Missile, Van Nuys; coordinator of engineering planning, manufacturing research engineer and production planning supervisor, Lockheed Missile, Sunnyvale.

*RAAB, WALLACE A. (1957) _________________________ Head, Mathematics Department
B.S., Morningside College, 1948; M.A., University of South Dakota, 1949; Ph.D., Iowa State College, 1958.
Experience: Teaching assistant, University of South Dakota; instructor, Eagle Grove Junior College, Iowa State College; mathematician, Naval Ordnance Test Station, Pasadena; senior dynamics engineer, Convair-A Division, General Dynamics Corporation.

RADIUS, CLARENCE (1946) _________________________ Head, Electronic Engineering Department
B.S., University of Chicago, 1932; graduate study, University of Chicago, Stevens Institute of Technology.
Experience: Engineer, Radiomarine Corporation of America; head, department of audio-video technology, RCA Institutes, New York; lecturer in television for NBC in New York, Chicago, Hollywood; registered professional engineer, California.

RALSTON, FURMAN, P. (1963) ______________ Biological Sciences
B.A., Simpson College, 1949; M.A., Drake University, 1952; Ph.D., Kansas State University, 1955; additional graduate study, University of Minnesota, Arizona State University, Indiana University.

*RANKIN, DAVID B. (1963) _________________________ Language Arts
A.B., University of Southern California, 1953; M.A., 1960; additional graduate study, University of London (Birkbeck College).
Experience: Teaching assistant, lecturer, and assistant baseball coach, University of Southern California; instructor and baseball coach, Alhambra High School, Coalinga College; instructor and chairman of the English department, Foothill College.

RAPP, JOHN B. (1959) _________________________ Electronic Engineering
B.S., University of California, 1940.

RATCLIFFE, RONALD V. (1963) _________________________ Music
B.A., University of Washington, 1956; M.M., University of Southern California, 1958.
Experience: Piano teacher; assistant professor, The College of the Ozarks; music director, Music-Go-Round Theater; buyer, The Boeing Company.

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RAUCH, RAYMOND C. (1963) .............................................. Business Management
B.S., University of Oregon, 1951; M.B.A., 1959; additional graduate study, Ohio State University.
Experience: Teaching assistant, Ohio State University; assistant professor, San Fernando Valley State College; underwriter, Fireman's Fund Insurance Company; general agent and partner, Powell & Rauch Insurance Agency; instructor, American College of Life Underwriters, Insurance Institute of America; consultant to the insurance industry.

RAYNER, CLARE G. (1963) .................................................. Music
Experience: U.S. Army Band; 7th Army Symphony; assistant, Indiana University; piano teacher, Palo Alto.

REAGAN, EVELYN D. (1946) (1954) ........................................ Library
B.S., College of St. Catherine, 1943.
Experience: Librarian, College of the Holy Cross, Worcester, Massachusetts; librarian, Charity Hospital School of Nursing, New Orleans; cataloger, California State Polytechnic College.

REECE, OSCAR E. (1956) ...................................................... Crops
B.S., Kansas State College, 1931; M.S., University of Minnesota, 1945; Ph.D., 1949.
Experience: Grade school principal, Hopewell and Smith Center, Kansas; agricultural instructor, Norcatur, Hope, and Silver Lake, Kansas; county agricultural agent, Rice County, Kansas; research fellow, University of Minnesota; assistant agronomist USDA, Division of Sugar Plants, Field Office, St. Paul, Minnesota; associate professor of agriculture, Iowa State Teachers College.

REMUND, CLIVE O. (1946) ..................................................... Agricultural Engineering
B.S., Utah State Agricultural College, 1931.
Experience: Teacher, Utah high schools; agricultural instructor and critic teacher, California high schools.

REYNOLDS, R. WALLACE (1953) ........................................ Mechanical Engineering
B.S., California (Pa.) State Teachers College, 1940; M.S., Purdue University, 1946; additional graduate study, University of Pittsburgh, University of Southern California.
Experience: Assistant educational adviser, Civilian Conservation Corps; weight engineer, Douglas Aircraft Company; ordnance engineer, Naval Ordnance Laboratory; instructor, Purdue University; head, engineering drawing, Washington and Jefferson College; assistant professor, University of Santa Clara; instructor, West Coast University, University of California at Los Angeles, part-time; engineering designer, Hughes Aircraft Company; consulting work in tool design and machine design.

RHoads, HOWARD (1956) ..................................................... Crops
B.S., Montana State College, 1951; M.S., 1952.
Experience: Fieldman, Great Western Sugar Co., Billings, Montana; instructor and assistant, Montana State College.

* RICE, ELMER H. (1959) .................................................. Head, Physical Sciences Department
B.A., Whittier College, 1947; Ph.D., University of Southern California, 1958.
Experience: Analytical chemist, Truesdail Laboratories; junior research biochemist, University of California Medical Center.

RICE, JAMES E. (1963) .................................................... Technical Arts
B.S., Kansas State College, 1956; graduate study, Fresno State College.

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RICH, GLENN W. (1953) Agricultural Engineering
Experience: Journeyman carpenter, U.S. Coast Guard.

RICHARDS, CARLOS C. (1946) Machine Shop
B.A., Santa Barbara State College, 1942.

RICHARDSON, JOY O. (1948) Mechanical Engineering
B.S., University of Nebraska, 1940; M. of Engr., Yale University, 1942.
Experience: Instructor, Yale University, New Haven Junior College, New Haven, Connecticut; instructor, Orland High School, Orland, California; machine designer, Rockbestos Products Corporation; engineer, Marlin Firearms Company; Bristol Aeronautical Corporation, New Haven, Connecticut; engineer, Johns Manville Corporation, Tilton, New Hampshire; vice president and treasurer, Richardson Industries, Incorporated, East Haven, Connecticut. Registered professional engineer, California.

RICKANSRUD, TORLEIF M. (1943) Physical Sciences
B.A., Luther College, 1922; M.S., Iowa State University, 1940; additional graduate study, University of St. Louis.
Experience: Superintendent of schools and director of science department, Rolla, North Dakota; Omemee, North Dakota; Lansing Iowa; electronics instructor, Advanced Radar School, Truax Field, Madison, Wisconsin.

RICKARD, HERMAN E. (1959) Dairy Engineering
B.S., Ohio State University, 1950; M.S., 1954; Ph.D., 1958.
Experience: Assistant Herdsman, research assistant, in charge of federal dairy breeding program, Ohio State University.

* RIDDLE, JEWEL M. (1959) Accountancy
B.A., San Jose State College, 1951; graduate study, Golden Gate College, University of California at Los Angeles, University of Southern California.
Experience: Instructor, Golden Gate College, Los Angeles Metropolitan College, University of California Extension; tax department, Perkins and Trousdale, CPA’s; staff accountant, Arthur Young and Company, CPA’s; certified public accountant.

RIDER, ROL W., JR. (1960) Business
B.A., University of California, 1941.

RIEBEL, JOHN P. (1947) English and Speech
B.S., University of Kentucky, 1924; A.B., University of Southern California, 1927; M.A., 1928; additional graduate study, University of Illinois.
Experience: Teaching, Georgia School of Technology; University of Illinois; Austin Peay Normal, Clarksville, Tennessee; General Motors Institute, Flint, Michigan; University of Detroit; Editor and author, L. W. Singer Company; Cadillac Motor Car Division; Gladding, McBean and Company; professional writing.

* RINALDI, JOHN A. (1963) Landscape Architecture
B.A., University of Southern California, 1957.
Experience: Draftsman, designer, architect: Maynard D. Houston, AIA; Kegley, Westphall and Arbogast, AIA; Jack Randall, Civil Engineer; Smith, Powell and Morgridge, AIA, Los Angeles; Palmer and Krisel, AIA, Santa Monica; private practice.

* Kellogg-Voorhis staff.
RITCHIE, RALPH W. (1957) ........................................ Electronic Engineering
B.A., University of California, Santa Barbara; M.A., Claremont Graduate School, 1958; additional graduate study, University of California at Los Angeles.
Experience: U.S. Naval Communications; Radiation Laboratory, University of California, Berkeley; microwave measurements consultant, U.S. Naval Bureau of Ordnance; founder and head of electronics department, Chaffey College; author two works on microwave techniques; holder first class radio-telephone license with radar endorsement.

RITTENHOUSE, EUGENE A. (1949) ................................ Placement Officer
B.S., University of California, Los Angeles, 1947; M.B.A., University of California, Berkeley, 1948; additional graduate study, University of California, Berkeley.
Experience: Bookkeeper, J. J. Elmore Company, Brawley; broker's clerk, Dean Witter & Co., Los Angeles; purchasing, War Department, USAAF, Trinidad, B.W.I.; U.S. Navy; instructor, social sciences; administrative assistant for personnel, office of the president, California State Polytechnic College.

ROBERTS, ALICE E. (1963) ........................................ Education
B.S., Milwaukee State Teachers College, 1940; M.S., University of Wisconsin, 1962.
Experience: Elementary school teacher, West Bend, Wisconsin; participant in Wisconsin Education Improvement Program; leader in team teaching and intern program.

ROCHE, EDWARD TOWNE (1959) ................................ Biological Sciences
B.A., San Diego State College, 1948; M.S., University of Southern California, 1952; Ph.D., University of Southern California, 1957.
Experience: Teaching assistant and field-laboratory research assistant on Navy and Air Force research projects in Alaska; instructor, Compton College, 1957-59.

RODIN, ROBERT J. (1953) ........................................... Biological Sciences
A.B., University of California, 1943; Ph.D., 1951.
Experience: Assistant botanist, University of California Herbarium; ranger naturalist, Yosemite National Park; administrative clerk, U.S. Marine Corps; expedition botanist, University of California African Expedition; teaching assistant, University of California; lecturer for extension division, University of California; professor of biology, Forman Christian College, Lahore, Pakistan; visiting assistant professor, University of California, Santa Barbara; lecturer, National Science Foundation Summer Science Program; visiting assistant professor and National Science Foundation fellow, Cornell University, New York.

ROEST, ARYAN I. (1955) ........................................... Biological Sciences
B.S., University of Virginia, 1945; B.S., Oregon State College, 1948; M.S., 1949; Ph.D., 1954.
Experience: Officer, U.S. Navy; teaching and research assistant, Oregon State College; assistant professor, Central Oregon College; forester, Oregon State Board of Forestry; lecturer, Extension Division, University of California; visiting assistant professor, University of California, Santa Barbara; lecturer, National Science Foundation Summer Science Program.

ROGALLA, JOHN A. (1959) ........................................ Farm Management
B.S., California State Polytechnic College, 1956; M.S., Cornell University, 1958.
Experience: U.S. Air Force; graduate assistant, Cornell University; material control analyst, Ryan Aeronautical Company.

ROGERS, LEO E. (1954) ............................................ Machine Shop
B.S., California State Polytechnic College, 1950.
Experience: Instructor, San Luis Obispo High School; engineering aid, Division of Highways, San Luis Obispo.

ROPER, ALAN T. (1963) ......................................... Aerospace Engineering
B.S.A.E., Purdue University, 1958.
Experience: Aerodynamicist, Boeing Company.

* Kellogg-Voorhis staff.
ROSEN, ARTHUR Z. (1953) ............................. Physical Sciences
A.B., University of California, 1941; Ph.D., 1952.
Experience: Physicist, University of California Radiation Laboratory; U.S.
Navy; teaching and research assistant, University of California; lecturer, University
of California, Santa Barbara College.

* ROSENROCK, W. WAYNE (1963) ...................... Mathematics

ROWLEY, WILLIAM P. (1958) ........................ Head, Agricultural Business Management
Department
A.B., University of California at Los Angeles, 1933; graduate study, University
of Southern California, Los Angeles State College.
Experience: Case supervisor, California State Relief and Welfare, Los Angeles;
field man, U.S.D.A., Agricultural Marketing Administration, Los Angeles and
Boise, Idaho; public relations director, Associated Produce Dealers and Brokers of
Los Angeles.

* RUETHER, HERMAN J. (1961) ........................ Social Sciences
B.S., Xavier University, 1952; M.A., 1961; additional graduate study, Claremont
Graduate School.
Experience: Teacher, Cincinnati Public Schools; instructor in military police
duties and procedures, Army; social worker, San Bernardino County Welfare
Department.

SALO, GLENN W. (1955) .............................. Agricultural Engineering
B.S., Montana State College, 1950; M.S., University of Idaho, 1955.
Experience: Shops officer, U.S. Air Force; instructor and assistant agricultural
engineer, University of Idaho; Research Fellow, University of Idaho.

SAMPSON, DEWITT F. (1961) ........................ Head, Food Processing Department
B.S., Iowa State University, 1927; Certificate Advanced Management Program,
Experience: Research chemist, American Can Company, Maywood, Illinois; dis-
ctrict manager of research, Portland, Oregon, Seattle, Washington, San Francisco;
general manager of technical service.

SANKOFF, LEO (1946) ............................... Poultry Industry
B.S., California State Polytechnic College, 1942; M.A., 1956.
Experience: Agricultural instructor, Fillmore High School.

SCALES, HARRY H. (1958) ............................. Education and Psychology
Experience: Teacher and counselor, Santa Barbara Junior College; associate
professor and consultant to industry and schools, Michigan State University; aerial
navigation training, U.S. Navy; teacher and guidance director, Redlands High
School; director of research, Arizona State Department of Education; teacher,
Superior and Safford, Arizona, public schools.

SCHEER, ARNOLD (1960) ............................. Crops
B.S., University of California, 1950; M.S., 1957.
Experience: Director vo-ag, Livingston High School; supervisor vo-ag, Merced
High School District; critic teacher vo-ag; radio farm announcer and director;
farm and ranch editor; fruit and grape farmer; instructor, U.S. Marine Corps.

* SCHENCK, W. DONALD (1956) ........................ Language Arts
B.A., University of Redlands, 1949; M.A., University of Southern California, 1955;
additional graduate study, University of Southern California, San Francisco State
College, Claremont Graduate School.
Experience: Teacher, San Bernardino City Schools; instructor, Mt. San Antonio
College, American Institute of Banking; editor for personnel department, Convair-
Pomona.

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B.S., University of Arizona, 1948; M.S., 1950; Ph.D., Ohio State University, 1952.
Experience: Agronomist, Zonolite Corporation; assistant professor and assistant soil scientist, Oregon State College and Oregon Agricultural Experiment Station; agronomist, California Spray Chemical Corporation; assistant professor plant science, Fresno State College.

SCHNEIDER, CATHERINE A. (1959) Library
Experience: Librarian, California State Polytechnic College; U.S. Army Special Services, Frankfort Post, Germany.

SCHNEIDER, KENNETH J. (1961) Mechanical Engineering
B.S.M.E., University of Southern California, 1958; M.S.M.E., 1961.
Experience: Research engineer, Convair, Physics Group; research and design engineer, Aerojet, Ordnance Division; design engineer, C. F. Braun, Alhambra; registered engineer, California.

SCHROEDER, WALTER P. (1957) Head, Education Department
B.S., Michigan State University, 1940; M.A., 1947; Ph.D., 1953.
Experience: Three years technical and management work in agriculture, business and industry; teacher, supervising teacher, and administrator in junior and senior high schools and unified districts, assistant professor, vocational education and education, Michigan State University; assistant placement director, Michigan State University.

SCHWARTZ, KENNETH E. (1952) Architectural Engineering
B. of Arch., University of Southern California, 1952.

SCOLINOS, JOHN H. (1960) Physical Education
B.S., Pepperdine College, 1950; M.A., University of Southern California, 1952; additional graduate study, University of Southern California.
Experience: Instructor and head coach, Pepperdine College; professional baseball player; U.S. Army.
SCOTT, CHESTER H. (1952) ........................................ Mathematics
Experience: Instructor, Sheridan High School, Wyoming; instructor, mathematics and navigation, Civilian Pilot Training School; counselor, Y.M.C.A.; instructor, mathematics, electronics, U.S. Navy; assistant professor, mathematics; Montana School of Mines; statewide counselor, University of Montana.

* SCOTT, WOODROW W. (1963) ........................................ Social Sciences
B.S., Utah State University, 1941; Social Work Certificate, 1942; M.S., University of Wisconsin, 1954; Ph.D., University of Southern California, 1960.
Experience: Officer, U.S. Naval Reserve; research assistant, University of Wisconsin; research associate, Wisconsin State Bureau of Alcohol Studies; origin-destination studies, Wisconsin State Highway Department; instructor, University of Southern California; associate professor, Pepperdine College.

SEEGER, GLENN E. (1954) ........................................ Welding
Experience: Instructor in biology and welding, Lassen Union High School and Junior College; welder and foreman, Interstate Steel Co., Chico; welder, Anderson's Welding Shop, Chico; welder and foreman, Pollock Shipbuilding Corp., Stockton; locomotive fireman, Western Pacific Railroad.

* SEIBERT, KATHARINE B. (1963) ...................................... Business Management
B.A., New Mexico Highlands University, 1948; M.A., 1951.
Experience: Teacher, high schools, New Mexico and California; associate professor, Chaffey College; certified professional secretary; instructor, University of Alabama, Extension Division; contract instructor, Maxwell AFB, Alabama.

SERVATIUS, OWEN L. (1947) ........................................ Business Administration
B.S., California State Polytechnic College, 1959.

* SEUBERLING, HARRISON P. (1963) ................................... Civil Engineering
B.S.C.E., University of Cincinnati, 1939; graduate study, University of Cincinnati.
Experience: Associate engineer, U.S. Engineer Office; engineer, Larson Hunt and White; Walter and Wilham; construction analyst, Veterans Administration; engineer, Vogt, Ivers, Seaman and Associates; Muller and Seuberling.

SHAEFFER, PAULINE (1961) ........................................ Home Economics
B.S., Juniata College, 1953.
Experience: Southern Counties Gas Company, Ventura; dietician, California State Polytechnic College.

* SHAEFFER, RALPH E. (1963) ..................................... Social Sciences
A.B., University of California, Los Angeles, 1951; M.A., University of California, 1955; Ph.D., 1962.
Experience: Teaching assistant, University of California, Davis; teacher, Sacramento City Schools; instructor, Oakland City College.

* SHAFE, MARIE E. (1963) ........................................ Library
A.B., Pomona College, 1959; M.L.S., University of California, 1960.
Experience: Bookmobile librarian, general librarian, New York Public Library.

* SHAPIRO, MILTON M. (1962) .................................... Social Sciences
A.B., Brooklyn College, 1943; Ph.D., University of Southern California, 1963.
Experience: Instructor, University of Southern California; assistant professor, Occidental College; economist and marketing analyst, National Industrial Conference Board, North American Aviation, Marquardt Corporation, World Trade Foundation, The Scherman Foundation, Jewish Agency for Palestine.

* Kellogg-Voorhis staff.
SHARPE, NORMAN (1937) Air Conditioning and Refrigeration Engineering
B.A., University of California at Los Angeles, 1929; M.A., University of Southern California, 1939.
Experience: Development engineer, Carrier Corporation; design engineer, Carrier Corporation; mathematics instructor, Los Angeles City Schools; design and construction engineer, Luppen and Hawley, Inc.; professional writing. Registered professional engineer, California.

SHERMAN, ROGER L. (1961) Business Administration
A.B., Ohio University, 1949; M.S., 1950.
Experience: Personnel representative, United Airlines; personnel supervisor, Boeing Airplane Company; employment and training manager, Hiller Aircraft Corporation; personnel manager, Dalmo Victor; personnel manager, Hazel Atlas Glass Company; personnel representative, Lockheed Aircraft Corporation; assistant professor of business, Texas A. & M.; extension instructor, University of California at Los Angeles and University of Washington.

SHIRLEY, DELBERT W. (1963) Agriculture Business Management
B.S., Oregon State University, 1959; M.Ed., 1963.
Experience: Vocational agriculture instructor, Siletz High School, Siletz, Oregon; graduate assistant, Oregon State University.

* SHRAGER, SIDNEY (1960) English
A.B., University of Southern California, 1949; M.A., University of California at Los Angeles, 1951; additional graduate study, University of Southern California.
Experience: Lecturer, University of Southern California; instructor, Chouinard.

* SIEGEL, BEN (1957) Head, Language Arts Department
B.A., San Diego State College, 1948; M.A., University of California, Los Angeles, 1950; Ph.D., University of Southern California, 1956.
Experience: Teaching assistant, University of California, Los Angeles, University of Southern California; lecturer, University of Southern California, Chouinard Art Institute; instructor, Los Angeles Evening Adult School; Danforth fellow, University of Chicago; radio, advertising, and newspaper work.

* SIMMONS, HAROLD F. (1958) Mathematics
Experience: Teaching fellow, University of Wichita, Wichita, Kansas; graduate assistant, Iowa State College, Ames, Iowa; assistant professor, University of Wichita, Wichita, Kansas.

SIMMONS, ORIEN W. (1961) Metallurgical Engineering
B.S.E., University of Michigan, 1935; M.S.E., 1948.
Experience: Metallurgist, Carnegie-Illinois Steel Company; Packard Motor Car Company; instructor, Rose Polytechnic Institute; officer U.S. Navy; research engineer, Battelle Memorial Institute; senior research engineer, Frankford Arsenal; Rem Cru Titanium Company and Crucible Steel Company; Climax Molybdenum Company; registered professional engineer, Ohio.

B.S., University of Chicago, 1921; Ph.D., 1925.
Experience: National research fellow in physics, California Institute of Technology; director, Cottrell Research Laboratory, Tennessee Coal, Iron and Railroad Company; research physicist, Stewart-Warner Corporation; American Harmonica Company and Naval Ordnance Laboratory; assistant professor, Washington University, St. Louis; associate professor, Tulsa University and Alabama Polytechnic Institute; physicist, U.S. Air Force.

* SKAMSER, HAROLD P. (1958) Dean, Engineering Division
B.E., Wisconsin State College, 1931; M.A., University of Minnesota, 1945; B.S.E.E., Michigan State University, 1948.

* Kellogg-Voorhis staff.
SKOUSEN, OWEN K. (1960) Electronic Engineering
B.A., University of California, Los Angeles, 1949; M.S., Stanford University, 1950; E.E., 1952; additional graduate study, University of New Mexico, Brigham Young University, Stanford University.
Experience: Senior instrumentation engineer, Marquardt Jet Laboratory, Ogden, Utah; research engineer, Sandia Corporation, Albuquerque, New Mexico; electronic development engineer, Hewlett-Packard Company, Palo Alto, California; instructor electrical engineering, Brigham Young University; electronics officer, U.S. Navy; teaching assistant, Stanford University.

SLAMA, MICHAEL M. (1960) Assistant Librarian
J.D., Charles University, Prague, 1945; M.A., University of Denver, 1954.
Experience: Catalog librarian, order librarian, assistant librarian, technical processes, University of Idaho.

SMEDLEY, DONALD B. (1959) Electronic Engineering
B.S.E.E., University of Oklahoma, 1956; graduate study, University of California, Los Angeles, and Los Angeles State College.
Experience: Electronics engineer, advanced guidance group, General Dynamics; senior design engineer, Space and Information Division of N.A.A.

SMITH, DUDLEY R. (1957) Agricultural Engineering
B.S., Cornell University, 1954; graduate study, Cornell University.
Experience: Instructor in agricultural engineering, State University of New York, Morrisville.

SMITH, GLEN H. (1962) English
Experience: Program director, Station KUOM, University of Minnesota; radio director and account executive, advertising agency, Ft. Wayne, Indiana; radio-TV officer, Naval Command, Tokyo; advertising manager, Station KGAY, Salem, Oregon; speech and forensics teacher, secondary schools, Oregon; free lance drama director.

SMITH, J. MURRAY (1960) English and Speech
Experience: Instructor in English and speech, Denver University, Michigan State University and Wichita University; technical director, Denver Civic Theater; president, The Knitter Company (mfg.), Denver; staff director, Pasadena Playhouse; lt. col. U.S. Marine Corps (retired).

SMITH, M. EUGENE (1946) Social Sciences
A.B., University of California, 1934; M.A., 1937; Ed.D., University of Oregon, 1958.
Experience: Instructor and coach, Piedmont High School, Piedmont; graduate assistant, Universities of California and Oregon; officer, U.S. Army.

SMITH, NELSON L., III (1962) Technical Arts
B.S., Lowell Technological Institute, 1960; M.S., 1962.
Experience: Senior systems analyst, quality control engineer, Raytheon Company, Lowell, Massachusetts.

SMITH, RICHARD H. (1960) Business Management
B.S., Massachusetts Institute of Technology, 1948; M.B.A., Northwestern University, 1954.

SMITH, STANLEY B. (1963) Assistant to the Dean of the College
B.S., University of Utah, 1953; M.B.A., 1962.
Experience: J. C. Penney Company; commissioned officer, U.S. Air Force; assistant director of personnel, University of Utah.

* Kellogg-Voorhis staff.
SMITH, WARREN T. (1952) -------------- Dean, Agriculture Division
B.S., University of California, 1943; M.S., University of California, Davis, 1953.
Experience: Forester, United States Forest Service; U.S. National Park Service; stores, U.S. Navy (civilian); director of vocational agriculture and critic teacher, Madera Union High School.

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.
Experience: Instructor, Central College; lecturer and instructor, University of British Columbia; instructor and assistant professor, University of California at Santa Barbara; University of Oregon Institute of Marine Biology.

SPINK, ROBERT (1960) ----------- Graduate Manager
B.S., California State Polytechnic College, 1957.
Experience: College union director, Clarkson College of Technology, Potsdam, New York.

* STANSEL, DOYLE J. (1958) ------ Counselor, Test Officer
B.A., Pepperdine College, 1954; M.A., 1958; additional graduate study, University of Southern California.
Experience: Teaching assistant, acting test officer, Pepperdine College; psychometrist, Pepperdine Psychology-Speech Clinic; psychological intern, John Tracy Clinic, Los Angeles.

STANFIELD, WILLIAM D. (1963) ------ Biological Sciences
B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, 1963.
Experience: Cadet teacher, Chaffey Union High; line officer, U.S. Naval Reserve; vocational agriculture teacher, Fortuna Union High School; teaching assistant and research assistant, University of California.

STECHMAN, JOHN V. (1960) ---------- Animal Husbandry
B.S., University of California, Davis, 1957; M.S., 1960.
Experience: U.S. Forest Service; U.S.D.A., Agricultural Research Service; laboratory assistant, University of California; biological assistant, U.S. Army.

STEFANAC, JOSEPH B. (1958) ------ Mathematics
B.S., U.S. Naval Academy, 1926; M.S., Purdue University, 1958.
Experience: Captain, U.S. Navy (retired); marine engineering design, Bureau of Ships, Navy Department; engineering and command duties, U.S. Navy ships; mathematics instructor, Purdue University; participant National Science Foundation Institute, Stanford University, 1960.

STEUCK, FRED H. (1947) ----------- Electronic Engineering
B.S., Iowa State College, 1937.
Experience: Engineer, Nebraska Power Co.; manager, O'Brien Co.; Rural Electric Co-op., Iowa; instructor, Iowa State College; officer, U.S. Navy; registered professional engineer, California.

* STEWART, GLENN R. (1963) ------ Biological Sciences
B.S., California State Polytechnic College, 1958; M.A., Oregon State University, 1960; Ph.D., 1963.
Experience: Graduate assistant in zoology, Oregon State University.

STOBBE, ARTHUR J. (1949) ------- Library
Ph.B., Marquette University, 1937; B.L.S., Syracuse University, 1947; M.L.S., University of California, 1949.
Experience: Officer, U.S. Army Air Force; art and music librarian, Milwaukee Public Library; reference librarian, Grosvenor Reference Library; research assistant, University of California School of Librarianship; library, Syracuse University.

* Kellogg-Voorhis staff.
STOFFEL, EDWARD O. (1957) Mechanical Engineering
B.M.E., University of Santa Clara, 1950; M.E., University of Santa Clara, 1955.
Experience: Engineer, Autonetics, Aerojet-General, Northrop Aircraft; Robertshaw-Fulton Controls, Norris-Thermador Corp.; chemist, U.S. Industrial Chemicals; registered professional engineer, California.

STOKER, LYMAN P. (1957) Mechanical Engineering
B.S., California Institute of Technology, 1924.
Experience: Development engineer, Natural Gas Equipment; officer, U.S. Navy; president and owner, Precision Control Co.; assistant manager, Pacific Gas & Electric Co.; engineer, Union Oil Co.; draftsman, Elect. Products Co.

STONE, JOICS B. (1961) Associate Dean (Counseling and Testing)
A.B., Brigham Young University, 1947; M.S., University of Utah, 1950; Ph.D., 1952.
Experience: Director, Industrial Psychological Services, California Test Bureau; assistant professor (personnel and guidance), Brigham Young University; consultant, Columbia-Geneva Steel Company.

STONER, HOWARD F. (1960) Mechanical Engineering
B.S., U.S. Naval Academy, 1932; M.S., Massachusetts Institute of Technology, 1941.
Experience: U.S. Navy, operations officer for U.S. submarines; supervisor of shipbuilding, Electric Boat Co.; repair and construction superintendent, Mare Island Shipyard; production officer, Long Beach Naval Shipyard.

STOOKEY, ELLEN T. (1961) Home Economics
B.S., University of Illinois, 1943; M.A., 1950; additional graduate study, Stanford University.
Experience: Elementary teacher, Illinois; vocational home economics teacher, Illinois; supervising teacher, University of Illinois; teacher trainer, University of Illinois; special service, U.S. Army Air Force; regional supervisor, Bureau of Home-making Education, California State Department of Education.

STOUT, FERN D. (1962) Education
B.S., New Mexico State University, 1947; M.S., Eastern New Mexico University, 1957; Ed.D., University of New Mexico, 1962.
Experience: Teacher, principal and superintendent of public schools in New Mexico; assistant executive secretary, New Mexico State Boards Association; editor, THE SPOTLIGHT, official publication of New Mexico School Boards Association; member, Board of Regents, Eastern New Mexico University; member, Executive Committee, New Mexico Education Association.

STRASSER, J. EDWARD (1960) Technical Arts
B.S., California State Polytechnic College, 1958.

STRAUSS, L. HARRY (1961) Library
B.S., George Williams College, 1935; M.A., Graduate Library School, University of Chicago, 1942; additional graduate study, University of Michigan.
Experience: Librarian, George Williams College; Chicago College of Osteopathy; Northwestern Michigan Junior College; instructor in audio-visual education, University of Oklahoma; audio-visual consultant, National Council of the Y.M.C.A.; executive secretary, Commission on Motion Pictures in Adult Education; superintendent of schools, Rapid City and Cedarville, Michigan.

STREICHERT, GRETCHEN (1958) Home Economics
B.S., Oregon State College, 1936; M.S., 1951.
Experience: Teacher, high schools; home adviser, University of California Agricultural Extension; nursery school supervisor and instructor, Oregon State College; instructor, Modesto Junior College; personnel field counselor, Oregon Shipbuilding Corporation; teacher-counselor, Oregon State School for Girls.
STUBBS, DANIEL F. (1963) Mathematics
B.S., Purdue University, 1960; M.S., Rensselaer Polytechnic Institute, 1962; additional graduate study, Purdue University.
Experience: Teaching assistant, Purdue University; engineer, Knolls Atomic Power Laboratory.

*STULL, ROBERT B. (1947) Physical Education and Athletics
A.B., Whittier College, 1941; M.A., 1947; additional graduate study, University of Southern California.

*SUTHERLAND, RODNEY D. (1960) Acting Head, Aerospace Engineering Department
B.S., University of California, Los Angeles, 1952; M.S., 1953; additional graduate study, Massachusetts Institute of Technology.
Experience: Rocket design and chemical engineer, U.S. Naval Ordnance Test Station, Inyokern; senior thermodynamics and propulsion engineer, Convair, Pomona.

*SUTTON, ARTHUR W., JR. (1961) Electronic Engineering
B.S.E.E., Rose Polytechnic Institute, 1956; graduate study, Ohio State University.
Experience: Project engineer, Wright Air Development Division, Dayton, Ohio.

SWARTOUT, DOUGLAS H. (1963) Library
A.B., Syracuse University, 1951; M.S.L.S., 1952.
Experience: Librarian, State Teachers College, Cortland, New York; instructor and assistant librarian, Ferris Institute; assistant professor and assistant librarian, Michigan College of Mining and Technology; assistant college librarian, State University College, Fredonia, New York.

*SYVERSON, MAGNUS (1957) Physical Education
Experience: Teacher-coach, Newburg and Klamath Falls, Oregon; instructor, Portland State College; assistant professor, University of California at Los Angeles; U.S. Navy.

SZIGETHY, NICHOLAS (1961) Library
Ph.D., Erzebet University, Pecs, Hungary, 1940; M.L.S., Columbia University Library School, 1958.
Experience: Columbia University School of Business Library; cataloger, Cornell University Library; cataloger, University of Nevada Library.

*SZIJJ, LASZLO J. (1963) Biological Sciences
B.A., University of Sciences, Budapest, Hungary, 1954; Ph.D., University of Toronto, 1962.
Experience: Assistant curator of birds, National Museum, Hungary; research assistant, Royal Ontario Museum, Toronto, Canada; laboratory instructor, University of Toronto; instructor, Loyola University, Chicago.

TAYLOR, MORRIS P. (1954-55) Mechanical Engineering
B.A., Stanford University, 1923; graduate study, Massachusetts Institute of Technology.
Experience: Tester, Southern Pacific Company; research engineer, Fruit Industries, Inc.; engineer, Bureau of Seismology, U.S. Coast and Geodetic Survey; engineer, Southern Pacific Company; design engineer, Westinghouse Electric Corporation; registered professional engineer, California.
* Kellogg-Voorhis staff.
TELLEW, FUAD H. (1960) ___________________________Social Sciences
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University
of Southern California, 1954; Ph.D., 1959.
Experience: Accountant, Engineering Department, Iraqi State Railways; super-
visor, Testing Bureau, University of Southern California; teaching assistant and
lecturer, University of Southern California.

* TENNANT, FRANK A. (1955) ___________________________English and Journalism
B.A., University of California, Los Angeles, 1950; M.S., 1953.
Experience: Editor, Monterey Park Californian; reporter, Los Angeles Mirror;
director of press relations, Title Insurance and Trust Company, Los Angeles;
United States Army, psychological warfare unit.

THOMAS, DORIS ANN (1961) ___________________________Physical Education
Experience: Medical technician, Wilkinsburg Hospital, Pennsylvania, (Certifi-
cate-Medical Technician); nature and biology, Carnegie Museum, University of
Pittsburgh and Pittsburgh City Parks; Community House, Kingsley House, Pitts-
burgh; Grade and High School, Phoenix and Peoria, Arizona; Exeter High School,
Exeter.

* THOMAS, WILLIAM O. (1960) ___________________________Electronic Engineering
B.S., New Mexico State University, 1951.
Experience: Distribution engineer, estimator, Southern California Edison; com-
munications officer, 40th Inf. Div., U.S. Army; graduate student training program,
Westinghouse Electric Corp.; physical science laboratory supervisor, New Mexico
State College.

* THOMPSON, BEN F. (1961) ___________________________English and Journalism
Experience: Reporter, Harrisburg Patriot-News; state editor, Williamsport Sun-
Gazette; business editor, Honoilul Star-Bulletin; Hawaii field representative,
Dudley-Anderson-Yutzy; technical writer-editor, Institute of Transportation and
Traffic Engineering, University of California, Richmond Field Station.

THOMSON, DAVID H. (1946) ___________________________Biological Sciences
B.S., University of Arizona, 1944; M.A., Claremont Graduate School, 1948; addi-
tional graduate study, Oregon State College and University of Oregon.
Experience: Laboratory instructor, Pomona College; ranger-naturalist, Sequoia
National Park.

*THORNBURGH, PAUL A. (1962) ___________________________Psychometrist (Counseling and Testing)
B.A., University of California, Santa Barbara, 1955; graduate study, Los Angeles
State College.
Experience: Psychometrist, Advisement Service, Los Angeles City Schools.

THRASHER, FRANK P. (1963) ___________________________Crops
B.S., Montana State College, 1951.
Experience: Farmer-owner, Bozeman, Montana; research technician and agrono-
mist, U.S. Department of Agriculture Agricultural Research Service, Bozeman,
Montana.

THURMOND, WILLIAM (1951) ___________________________Biological Sciences
A.B., University of California, 1948; M.A., 1950; Ph.D., 1957.
Experience: Instructor, San Mateo Junior College; associate in zoology, Univer-
sity of California; instructor, summer session, University of California, 1957-59;
Director, National Science Foundation, Summer Science Training Program for
secondary students, California State Polytechnic College.

* Kellogg-Voorhis staff.
TOONE, HARMON (1952) Head, Dairy Department
B.S., University of Idaho, 1940; M.A., California State Polytechnic College, 1956.
Experience: Director of vocational agriculture at Moreland, Ucon, and Firth high schools, Idaho; superintendent, Firth High School, Idaho; director of vocational agriculture, Riverdale High School; special supervisor, Bureau of Agricultural Education.

*TOTTEN, JESSIE (1961) Physical Education
B.S., Oregon State College, 1953; graduate study, Portland State College, University of California at Riverside, University of California at Los Angeles.
Experience: West Linn High School and Beaverton High School in Oregon; instructor, University of Idaho; teacher, Pacific High School; city recreation work, counselor at Camp Tamarack.

TREMBLY, DEAN (1961) Counselor
Experience: Industrial personnel consultant, Human Engineering Laboratory, Fort Worth, Texas; testing and counseling, University of Illinois.

TROUTNER, WILLIAM R. (1942) Crops Vocational Certificate, California State Polytechnic College, 1934; B.S., University of California, Davis, 1938.
Experience: Agriculture instructor, Pomona High School and Junior College; agriculture instructor and critic teacher, San Luis Obispo Senior High School.

B.S., California State Polytechnic College, 1952.

*TUCKER, DOROTHY McNEILL (1957) Psychology
B.S., University of Minnesota, 1945; M.S., Illinois State Normal University, 1949; Ed.D., University of California, Los Angeles, 1959.
Experience: Recreation director, instructor, Washington Park High School, Racine, Wisconsin, Lincoln College, Western Illinois State College, San Bernardino city schools; counselor, San Bernardino Valley College; California certified psychologist.

TURNER, PEARL (1951) Library
A.B., San Jose State, 1937; M.S., University of Southern California, 1949; M.L.S., Texas State College for Women, 1951.
Experience: Teacher in elementary schools, Visalia, Los Angeles, Riverside; officer, U. S. Navy.

UDRY, J. RICHARD (1962) Social Sciences
B.S., Northwestern University, 1950; M.A., Long Beach State College, 1956; Ph.D., University of Southern California, 1960.
Experience: Social science instructor and department head, Western High School, Anaheim; assistant professor, Chaffey College; visiting professor, University of Kentucky; professional musician; production expediter and production planning; merchandise planning; radio advertising.

VAN DE VANTER, GORDON L. (1960) Crops
B.S., California State Polytechnic College, 1953.
Experience: Vegetable grower for seven years.

* Kellogg-Voorhis staff.
* VOLSKI, CHESTER A. (1962) ___________________________ Landscape Architecture
B.S., Michigan State University, 1956; M.L.A., Harvard University, 1957.
Experience: Landscape architect with Milton Baron, Lansing; Chambers and
Moriece; site planner with Michigan State University campus site planning office,
and A. Carl Stelling Assoc.; planner and landscape architect, The Architects
Collaborative; urban planner, U.S. Air Force.

VORHIES, RALPH M. (1946) ___________________________ Crops
B.S., University of Missouri, 1938; M.A., 1941.
Experience: Agriculture instructor at Belton and Couch High Schools, Missouri;
instructor, Southeast States Teachers College, Cape Girardeau, Missouri; officer,
U.S. Navy.

* VOUGHT, ELDON J. (1961) ____________________________ Mathematics
A.B., Manchester College, 1957; M.A., University of Michigan, 1958; additional
graduate study, University of Michigan.
Experience: Instructor, Pomonca College.

VROOMAN, C. W. (1961) _______________________________ Farm Management
B.S.A., University of British Columbia, 1934; M.S.A., 1936; Ph.D., Oregon State
College, 1949.
Experience: Feedlot operator, Burns and Company; stockyards foreman and live-
stock buyer, Canada Packers, Ltd.; agricultural economist, Canadian Department
of Agriculture; instructor of animal husbandry, University of British Columbia;
assistant professor agricultural economics, Oregon State College; livestock and
agricultural consultant.

WALKER, CLIFFORD L. (1957) __________________________ Medical Officer
Experience: Internship, Los Angeles County Hospital; residency, San Mateo
County General Hospital; U.S. Army; U.S. Public Health Service; private prac-
tice, Half Moon Bay; member, American Academy of General Practice.

WALKER, HOWARD (1957) _____________________________ Physical Sciences
Experience: U.S. Public Health Service, postdoctorate fellow, American Meat
Institute Foundation, University of Chicago; group leader, Veterans Hospital,
Downey, Illinois; research associate, Northwestern University.

WALKER, WALTER A. (1963) ____________________________ Counselor
A.B., New School for Social Research, 1950; graduate study, New York Uni-
versity.
Experience: Supervising psychologist, Rockland County New York Center for
Mental Health; psychotherapist, Rockland Consultation Center; certified psy-
chologist, New York.

* WANG, MARTIN I. (1959) ____________________________ Audiovisual Coordinator
B.A., University of Southern California, 1949; M.S., 1950; additional graduate
study, University of Southern California.
Experience: Instructor, Torrance, Long Beach, El Camino College; teaching
assistant and instructor, audiovisual education, University of Southern California.

WARD, WESLEY S. (1954) _______________________________ Architectural Engineering
B. of Arch., University of Southern California, 1933.
Experience: Engineering assistant, Pacific Telephone and Telegraph Company;
officer, U.S. Air Force; surveyor, City of Santa Ana; design draftsman, Benedict
Beckler and Kochler, Architects and Engineers; construction supervisor, Everett
E. Parks, Architect; registered architect, California.

WARDEN, ROBERT D. (1961) ____________________________ Agricultural Engineering
B.S., California State Polytechnic College, 1960.
Experience: Junior civil engineer, California State Department of Water Re-
sources.

* Kellogg-Voorhis staff.
* WARHURST, DONALD E. (1957) ........................................ Physical Education
A.B., University of California, 1943; M.S., University of Southern California, 1951; additional graduate study, San Francisco State College, University of Nevada, University of California, Fresno State College.
Experience: Teacher, Piedmont High School, Santa Ana High School; coach, Santa Ana High School, San Bernardino Valley College, Modesto High School.

WARNER, RICHARD G. (1963) ........................................ Physical Sciences
B.S., California State Polytechnic College, 1963.
Experience: Camp maintenance, Yolo County Y.M.C.A.; electronics technician, Litton Industries.

* WASSEL, GUSTAV N. (1961) ....................................... Electronic Engineering
Experience: Systems engineer, Space Science Department, Consolidated Systems Corp.; graduate research assistant, California Institute of Technology; development engineer, Nordon Division United Aircraft; machinist, Reuland Electric Corp.; electrical draftsman, U.S. Electric Motors Corp.; instructor, electrical systems, U.S. Air Force; registered professional engineer, California.

* WEEKS, LOWELL K. (1947) ........................................ Chairman, Music Department
B.A., University of New Mexico, 1938; graduate study, University of New Mexico, University of Southern California, Claremont Graduate School.

* WEISSBUCH, THEODORE N. (1962) .............................. Language Arts
B.A., Los Angeles State College, 1955; M.A., 1956, additional graduate study, University of Iowa.
Experience: Instructor, University of Nebraska; instructor, University of Iowa.

* WELCH, HARRY V., JR. (1947) .................................... Agronomy
B.S., University of California at Los Angeles, 1941; M.S., 1953.
Experience: University of California Citrus Experiment Station, Riverside; Farm Security Administration.

* WELLS, HAROLD F. (1954) ........................................ College Librarian
Experience: Reference assistant, Eastern Washington College of Education; junior librarian, Fresno State College.

* WELLS, WALTER (1963) ........................................ Language Arts
Experience: Market research analyst, Sealtest Division, National Dairy Corporation; radio and TV time buyer, Grey Advertising Incorporated, New York; teaching assistant, New York University.

WEST, HOWARD (1959) ........................................ Assistant to the President
B.A., Pepperdine College, 1956.
Experience: Apprentice reporter, Los Angeles Examiner; journalism instructor and acting director of public relations, Pepperdine College; editor, America's Builders; publications consultant, Southland Press.

WESTON, RALPH E. (1948) ........................................ Mathematics
A.B., Stanford University, 1922; M.A., 1932; additional graduate study, College of Pacific, Stanford University, University of Washington, University of California, Oregon State College.
Experience: Electrical engineering, San Joaquin Light and Power Company; teaching, Stanford University, Chaffee Junior College, Sacramento Junior College, University of Idaho, Southern Branch; University of Southern California.

* Kellogg-Voorhis staff.
WHALEY, GLEN V. (1963) ........................................ Library
Experience: Reference librarian, Drake University; librarian, Milwaukee Public Library.

* WHANG, SUKOO J. (1963) ....................................... Biological Sciences
B.S., Oregon State University, 1957; M.S., University of California, Los Angeles, 1960; Ph.D., 1963.
Experience: Chemist, Sunkist Growers; post graduate research serologist, University of California at Los Angeles Medical Center.

WHEELER, ROBERT R. (1961) ...................................... Animal Husbandry
B.S., Colorado State University, 1952; M.S., 1955, Ph.D., Oregon State University, 1962.
Experience: Irrigated farming; ranching; graduate assistant and graduate fellow in animal nutrition, Oregon State University; Junior animal husbandman, Oregon Agricultural Experiment Station.

WHIPPLE, OMER K. (1956) ........................................ Physical Sciences
A.B., Dartmouth College, 1936; M.A., Columbia University, 1938.
Experience: Biochemical research chemist, Long Island College of Medicine; instructor in chemistry, Norwich University; research chemist, Vermont Bureau of Industrial Research; professor of quantitative analysis, University of Tulsa; chemical consultant, Tulsa, Oklahoma.

WHITE, MARY LOU (1961) ........................................ Coordinator, Women's Physical Education
B.S., Oregon State University, 1946; M.S., Washington State University, 1953.
Experience: St. Helens, Oregon, High School instructor; physical education instructor, Clark College, Vancouver, Washington.

* WHITE, MILTON R. (1959) ..................................... Placement Officer
B.S., California State Polytechnic College, 1950.
Experience: Agricultural consultant, Los Angeles Chamber of Commerce; sales and trade association executive, California Wool Growers Association; sales representative, General Mills, Inc., Larrowe; U.S. Marine Corps.

WHITING, FRANCIS F. (1946) ................................. Chairman, Machine Shop Department
B.S., Stout Institute, 1931; M.A., University of Minnesota, 1938.
Experience: Teacher: Eau Claire, Wisconsin; Minneapolis, Minnesota. Instructor, Kent State University; assistant professor, University of Minnesota; officer, U.S. Navy.

* WHITLEY, MARY E. (1961) .................................... Business Management
B.S., Northeastern State College, 1946; M.S., Oklahoma State University, 1954; additional graduate study, University of Hawaii.
Experience: Secretary to superintendent of schools; instructor, College-High School; secretary, Department of Vocational Education; chairman of business department, Central High School.

WHITNEY, LESTER V. (1955) .................................... Physical Sciences
Ph.B., University of Wisconsin, 1930; Ph.M., 1932; Ph.D., 1936.
Experience: Teacher and demonstration assistant, University of Wisconsin; research associate, Wisconsin Natural History and Geological Survey; research in underwater physical measurements and consultant, Woods Hole Oceanographic Institute, Scripps Institution of Oceanography, Marine Biological Laboratory, University of Georgia; sonar and electrofishing research, University of Wisconsin; professor, Southwest Missouri State College.

WHITSON, MILO E. (1947) ...................................... Head, Mathematics Department
Ph.B., Washburn College, 1937; M.A., George Peabody College for Teachers, 1940; Ed.D., University of Southern California, 1949.
Experience: Teacher and administrator, Kansas; officer, U.S. Navy; lecturer, mathematics, University of Southern California.

* Kellogg-Voorhis staff.
WIGHT, HEWITT G. (1952) .................................................. Physical Sciences
B.S., University of Utah, 1943; Ph.D., University of California, 1955.
Experience: Teaching assistant, University of Utah, St. Martin's College, and the
University of California; officer, U.S. Army.

WILEY, J. BARRON (1956) .................................................. Education
B.S., University of Denver, 1940; M.B.A., 1948; Ed.D., Indiana University, 1955.
Experience: Accounting and business administration, various firms; officer, U.S.
Air Force; head, department of business education, Colorado Woman's College;
assistant professor of air science, Indiana University.

WILEY, RICHARD C. (1946) .............................................. Head, Welding and Metallurgical Engineering Department
Special engineering courses, Stanford University; industrial arts training, San
Jose State College and University of California.
Experience: Master mechanic and welder, Utah Construction Company; welding
instructor, Sacramento Junior College; Palo Alto, San Francisco, and San Jose
school systems; senior welding engineer, Joshua Hendy Iron Works; field engineer,
Bechtel Corporation; welding metallurgy consultant, Westinghouse Corporation;
X-ray Engineering International; Linde Company, New York.

WILLIAMS, EDWIN H. (1960) ............................................. Mechanical Engineering
B.S.M.E., University of California, Berkeley, 1949.
Experience: mechanical engineer, City and County of San Francisco; design
engineer, California Packing Corporation, San Francisco; development engineer,
Fraser and Johnston Company, San Francisco; assistant test engineer, Pacific Gas
and Electric Company, San Francisco; engineering and sciences extension instruc-
tor, University of California, Berkeley; registered professional engineer, California.

WILLIAMS, ROBERT E. (1957) ............................................. Architectural Engineering
B.S., California State Polytechnic College, 1954.
Experience: Assistant resident engineer, California Division of Highways; sur-
voyor and designer, Pacific Engineers; Griffith Construction Co.

WILLIAMSON, WALTER G. (1960) ....................................... Physical Education and Athletics
Experience: Teacher, El Monte Union High School District; professional foot-
ball, Washington Redskins, Pittsburgh Steelers.

WILLSON, IRWIN A. (1958) ............................................... Elementary Education
B.A., University of North Dakota, 1930; M.A.; University of Denver, 1940; addi-
tional graduate study, University of Denver, 1948-1958.
Experience: Teacher, high schools, North and South Dakota; principal and
director of elementary education, Canon City, Colorado; counselor, University of
Denver; director of curriculum, Stanislaus County Schools, Modesto; superintend-
ent of schools, Fall River Mills; assistant professor, San Diego State College; asso-
ciate professor, chairman of the division of education and psychology, director of
teacher education, Westmont College.

WILSON, BRUCE E. (1963) .............................................. Social Sciences
B.A., University of Miami, 1960; graduate study, Claremont Graduate School.
Experience: U.S. Army; newspaper editor; announcer, program director, radio
station WWPF; sports play-by-play, WWPF, WFOY, WHOO, WGGG; man-
ger, WSDX, WPRY; music director and Good Music magazine editor, WVCG;
instructor, University of Miami (Florida), Mt. San Antonio College.

WILSON, H. THOMAS (1963) ............................................ Landscape Architecture
B. of Arch., Massachusetts Institute of Technology, 1950.
Experience: Architect, Perkins and Will, Chicago; Kistner, Wright, and Wright,
Neutra and Alexander, Los Angeles; instructor, Pasadena City College, Extended
Day; private practice.

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WILSON, HAROLD O. (1936, 1946) Executive Dean, Operations Analysis
B.S., University of California, 1932; graduate study, Fresno State College, University of California at Los Angeles.
Experience: Director of agriculture, Excelsior Union High School, Norwalk; instructor of agriculture and head, swine department, California Polytechnic; regional supervisor, agricultural education, State Department of Education, California; dean, Voorhis Unit, California State Polytechnic College.

B.S., University of Southern California, 1953; M.B.A., 1954.
Experience: Owner-manager, Growell Shoes; lecturer, University of Southern California; U.S. Army and Air Force.

* WILSON, JOHN J. (1959) Social Sciences
B.S., Middlebury College, 1926; M.A., Claremont Graduate School, 1959; additional graduate study, George Washington University, U.S. Army Command and General Staff School, U.S. Air Force Staff School.
Experience: Director of procurement and production, and comptroller in U.S. Air Force.

WINGER, DONLEY J. (1963) Electronic Engineering
Experience: Graduate assistant and instructor, University of North Dakota.

WINNER, C. PAUL (1940) Associate Dean (Admissions and Records)
B.S., Montana State College, 1931.
Experience: Director of vocational agriculture and critic teacher, Montana and California high schools; teacher trainer of agriculture education.

* WINSLOW, DOROTHY V. (1959) Physical Sciences
B.A., University of California, Berkeley, 1957; graduate study, University of California, Berkeley.
Experience: Research biochemist, University of California Medical School, San Francisco.

* WINTERBOURNE, ROBERT J. (1953)
Associate Dean (Admissions and Records)
B.S., California State Polytechnic College, 1950; M.A., 1952.
Experience: Agricultural instructor, Shandon High School; director of vocational agriculture, Moorpark and Ventura High Schools; vice principal, Moorpark High School.

WIRSHUP, ARTHUR D. (1952) Mathematics
B.S., City College of New York, 1931; M.A., Columbia University, 1936; M.S., Oregon State College, 1951; Ph.D., 1963.
Experience: Teaching fellow in mathematics, Oregon State College; instructor, Multnomah College; radar officer, U.S. Army.

WOEHLK, MARY LOU (1963) Library
A.B., State College of Iowa, 1962; M.S.L.S., Western Reserve University, 1963.
Experience: Secretary, State College of Iowa; student assistant, State College of Iowa, Western Reserve University.

WOLCOTT, VICTOR F. (1962) Business Administration

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* WOLF, HARRY K. (1942) Electronic Engineering
A.B., Arizona State College, 1933; A.M., University of Arizona, 1941; Ed.D., University of Southern California, 1953.
Experience: Engineer for the Agricultural Adjustment Administration, high school teaching, electronics instructor for the Signal Corps, National Bureau of Standards, electronic engineer.

B.S., University of Oklahoma, 1929; graduate study, University of California, Los Angeles.
Experience: Engineer, Bell Telephone Laboratories; Bendix; Hughes Aircraft Company; National Defense Research Committee; independent consultant; foundation field representative, Research Corporation; licensed professional engineer.

WOODWORTH, JOHN A. (1949) Mathematics
A.B., Hastings College, 1939; M.S., University of Southern California, 1948; additional graduate study, University of California, Berkeley.
Experience: Teacher-principal, Nebraska schools; instructor, Baldwin Park, Salinas, Santa Ana Army Air Base; physicist, University of California Radiation Laboratory; principal, Hopland Union High School.

* WOOTTON, WILLIAM T. (1963) Electronic Engineering
B.S., United States Naval Academy, 1943; B.S.E.E., United States Naval Postgraduate School, 1952; S.M., Massachusetts Institute of Technology, 1953; additional graduate study, University of Minnesota, Armed Forces Staff College.
Experience: Assistant professor, Rice Institute; director, research and development, weapon and missile systems, United States Navy Department; fleet command, U.S. Navy; commander (retired) U.S. Navy.

WORK, LLOYD J. (1958) Physical Sciences
B.S., California State Polytechnic College, 1954; graduate study, California State Polytechnic College.

WRIGHT, DOROTHY S. (1946) Library
A.B., Occidental College, 1926; library certificate, University of California, 1939.
Experience: Pasadena Public Library; Long Beach School Libraries; Occidental College Library.

* WRIGHT, J. GARRARD (1962) Industrial Engineering
B.S., Oregon State College, 1954; graduate study, University of Washington.

WRIGHT, MARSHALL S. JR. (1960) Physical Sciences
B.A., Reed College, 1946, 1952; M.A., University of Oregon, 1949; additional graduate study, University of California.
Experience: Teaching assistant, University of Portland, University of Oregon; research assistant, University of California, and Institute for Metabolic Research; teaching assistant, University of California; instructor, Orange Coast College.

B.S.I.E., Virginia Polytechnic Institute, 1947.
Experience: Industrial engineer, Boeing Airplane Company, Seattle; chief industrial engineer, Micamold Corp., Tazewell, Virginia; chief industrial engineer, O'Sullivan Rubber Corp., Winchester; manufacturing engineer, Convair, Fort Worth; senior industrial engineer, RCA Victor, Pullaski; motion and time study engineer, Brunswick, Marion; instructor, Virginia Polytechnic Institute.
YEATON, ROBERT K. (1958) ____________________________ English and Speech
B.A., University of California, 1937; Ph.D., Innsbruck, 1950.
Experience: Rural rehabilitation supervisor, U.S. Department of Agriculture; chief, refugee welfare division, United Nations Relief and Rehabilitation Administration; Greek Mission; field supervisor, International Refugee Organization, American Zone, Austria; foreign student adviser and teacher, Pasadena City College; consultant in community and resources development, Jicarilla Apache Tribe; fellow, Fund for Adult Education.

* YORK, RICHARD G (1961) __________________________ Registrar
B.S., California State Polytechnic College, 1950; graduate study, California State Polytechnic College.
Experience: Director vocational agriculture, Simi Union High School; ranch manager, Perris and Santa Ana; production superintendent, Spinform Manufacturing Company, El Monte; pilot, U.S. Air Force.

* YOSHIKAWA, TOM T. (1962) __________________________ Ornamental Horticulture
B.S., California State Polytechnic College, 1950.
Experience: Instructor, Citrus Adult Education; nursery operator, Glendora; salesman, Leffingwell Chemical Company; head propagator and production foreman, Keeline-Wilcox Nurseries.

YOUNG, CHESTER G. (1954) __________________________ Assistant to Dean of College
A.B., San Diego State College, 1936; M.S., Stanford University, 1954; additional graduate study, University of California and San Jose State College.
Experience: Teacher and vice principal, Lemoore Elementary Schools; U.S. Navy; assistant professor, acting chairman, Mathematics Department, University of Santa Clara; instructor, mathematics, California State Polytechnic College.

YOUNG, FRANK E. (1956) __________________________ Physical Sciences
A.B., Colorado College, 1936; M.S., 1938; Ph.D., University of California, Berkeley, 1941; additional graduate study, Washington University, St. Louis, Missouri.

* ZELESKI, MARGARET L. (1960) __________________________ Registered Nurse
R.N., St. Vincent's College of Nursing, Los Angeles, 1945.
Experience: Pacific Electric Medical Department, Los Angeles; Beverly Hospital, Montebello; Inter-Community Hospital, Covina.

ZOLLARS, ALLEN M. (1959) __________________________ Aeronautical Engineering
B.S., U.S. Naval Academy, 1927; M.S., Massachusetts Institute of Technology, 1933.
Experience: Captain, U.S. Navy; executive vice president, Bay City Shovels; director of customer relations, Chromalloy Corporation.

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